XYZ

Machine Tools

XYZ 560 MINI MILL AND XYZ 710 VERTICAL MACHINING CENTER MANUAL

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1.0 Introduction

The machine is one product of the Vertical Machining Center series which is supplied by XYZ Machine Tools Ltd.

The machine consists of a bed base, headstock, main column, saddle, working table, operation panel, hydraulics, lubrication system, chip conveyor, chip collecting equipment, safety guards and CNC controllers, etc.

The machine is designed to machine workpieces that do not generate powder chips, corrosion or flammable substances, such as magnesium alloy.

The machine has a centralized lubrication system which is designed to lubricate various components such as ball bearings, flat bearings, flat slideways, circular slideways, linear guides, cams, gears, chains, etc.

This manual gives details of how to install, operate, adjust and maintain the machine.

Please carefully read all of the manuals provided. Do not use the machine unless you understand how to operate and stop the machine, and also understand all of the safety matters. Please contact us with any queries you may have.

1.1 Manual Organization

Section 2 of this manual provides important safety information. All operators of this product must review this safety information.

Section 3 describes the functions of the machine, rotary type tool changer and centralized lubrication system, complete with a full technical specification.

Section 4 gives details on the shipping and handling of the machine.

Section 5 introduces the operator to the installation procedure.

Section 6 gives an overview of the operation modes available and general operational procedures.

Section 7 gives details of adjustments which the operator may be required to make.

Section 8 gives details of the maintenance procedures to be done by the operator.

Section 9 lists the common faults for the rotary type tool changer and the centralized lubrication system.

Section 10 gives details of the parts lists for the 560 Mini Mill, rotary tool changer and centralized lubrication system.

Section 11 gives details of the parts lists for the 710 Vertical Maching Center, rotary tool changer and centralized lubrication system.

Section 12 provides an overview of the wiring for the machine.

Section 13 contains the standard warranty for the machine.

2.0 Safety

The safe operation of the machine depends on its correct use and the precautions taken by the operator.

- Read and understand this manual. Make sure the operator understands the operation and safety requirements of the machine before operating it.
- Always wear the correct personal protective equipment.
- Do not wear gloves, rings, watches, long sleeves, neckties, jewellery or any other loose items when around or operating the machine.
- Obey the necessary COSHH and risk assessments.
- The machine is to be only used for the milling and drilling of cold metal within the stated capacity of the machine and axes movement by manual use of handwheels, jogstick or CNC control.
- The machine must only be operated by trained and experienced operators.
- The machine must be used in a standard workshop environment and is not suitable for potentially explosive atmosphere.
- Any other use of the machine must be subjected to a risk assessment by a responsible person.

2.1 Safety Publications

The following publications must be obeyed to ensure the safe use of the machine.

EC Machinery Directive 2006/42/EC and Power Provision and Use of Work Equipment Regulations.

2.2 Warnings, Cautions and Notes

2.2.1 Warnings, Cautions and Notes Used in this Manual

WARNING - Hazards or unsafe practices that may result in severe personal injury or death. These are orange in colour.

Caution - Hazards or unsafe practices that could result in minor personal injury and/ or damage to the equipment. These are yellow in colour.

Note - Calls attention to specific issues regarding special attention or understanding.

2.2.2 List of Warnings in this Manual

WARNING - The machine is equipped with safety devices. Do not modify any safety devices on this machine. If changes to these safety devices are made, XYZ Machine Tools will not be responsible for any issues of product liability. Any changes will also invalidate any remaining warranty entitlement.

WARNING - When the noise level is high in the working environment, wear earplugs and appropriate personal protective equipment to prevent injury.

WARNING - Make sure the machine has fully stopped before opening the one-piece door. If the door is opened during operation the machine stops to protect the operator from debris, cutting coolant and moving parts. Make sure you close the one-piece front door before you start the machine.

WARNING - Do not lift the machine with lifting equipment that does not conform to the load capacity. This can result in personal injury and damage to the machine and equipment.

WARNING - Lethal Voltages. Use suitably qualified electricians to install and maintain the machine electrical equipment. Failure to do so will result in a lethal electric shock or serious injury.

WARNING - Danger of electrical shock. Do not turn on power before the protective grounding has been correctly connected. Failure to do so will result in a lethal electric shock or serious injury.

WARNING - Before operating the machine, make sure the wires and cables are insulated correctly to prevent electric shock and serious injury.

WARNING - Risk of serious injury. Make sure the main power supply to the machine is isolated and warning signs are displayed before inspecting the belt tension. Failure to isolate the main power supply can result in serious injury.

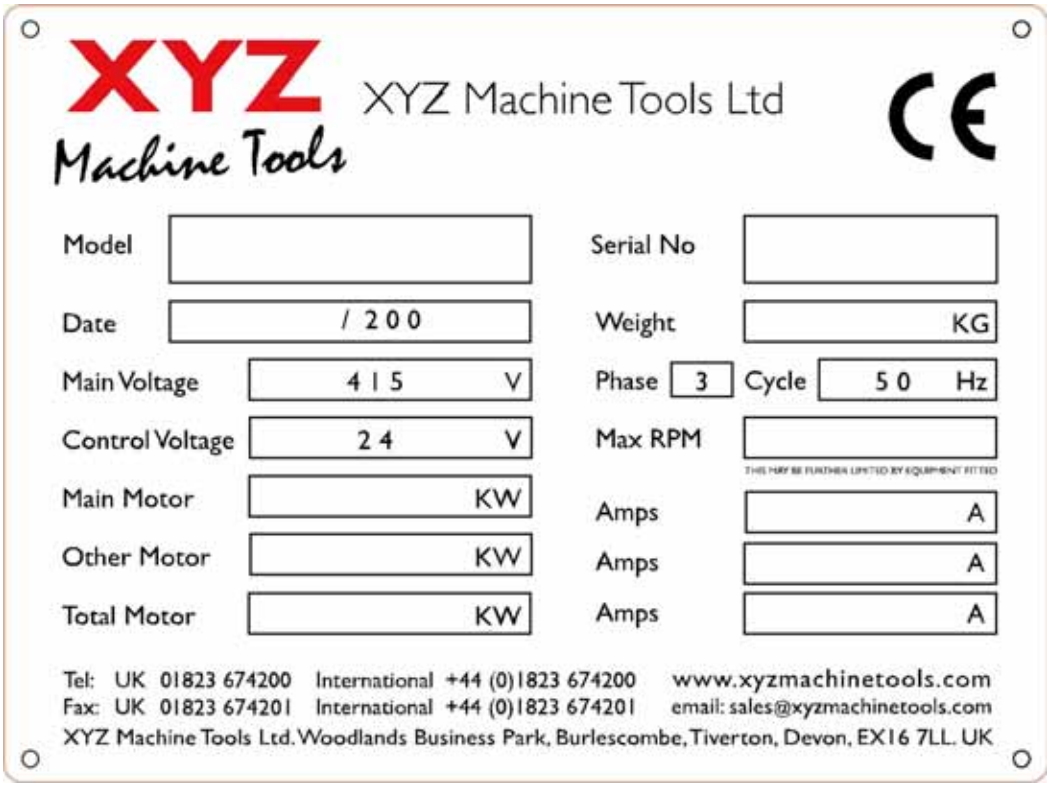

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Figure 1 Warning and danger signs on the machine

SAFETY WARNING!
• Secure loose hair and clothing.
• Wear eye protection.
• Do Not touch rotating tools.
• Never operate machine with doors open.
• This equipment should only be operated by qualified personnel that have been trained in the operation and use of this equipment.
• Remove electrical power before servicing.
• Maintenance should only be performed by a qualified and trained service technician.
• Please read the service manual in it entirety before performing maintenance on the machine.
• Do Not perform maintenance when machine is running.
• Use only the recommended lubricating oils.
• Lubricating oils and cutting fluids can be dangerous if inhaled, touched or ingested.
• This machine is automatically controlled and can start at any time. keep clear of all moving parts.
• Do Not machine flammable or toxic materials.

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Figure 2 Warning and danger signs on the machine (continued)

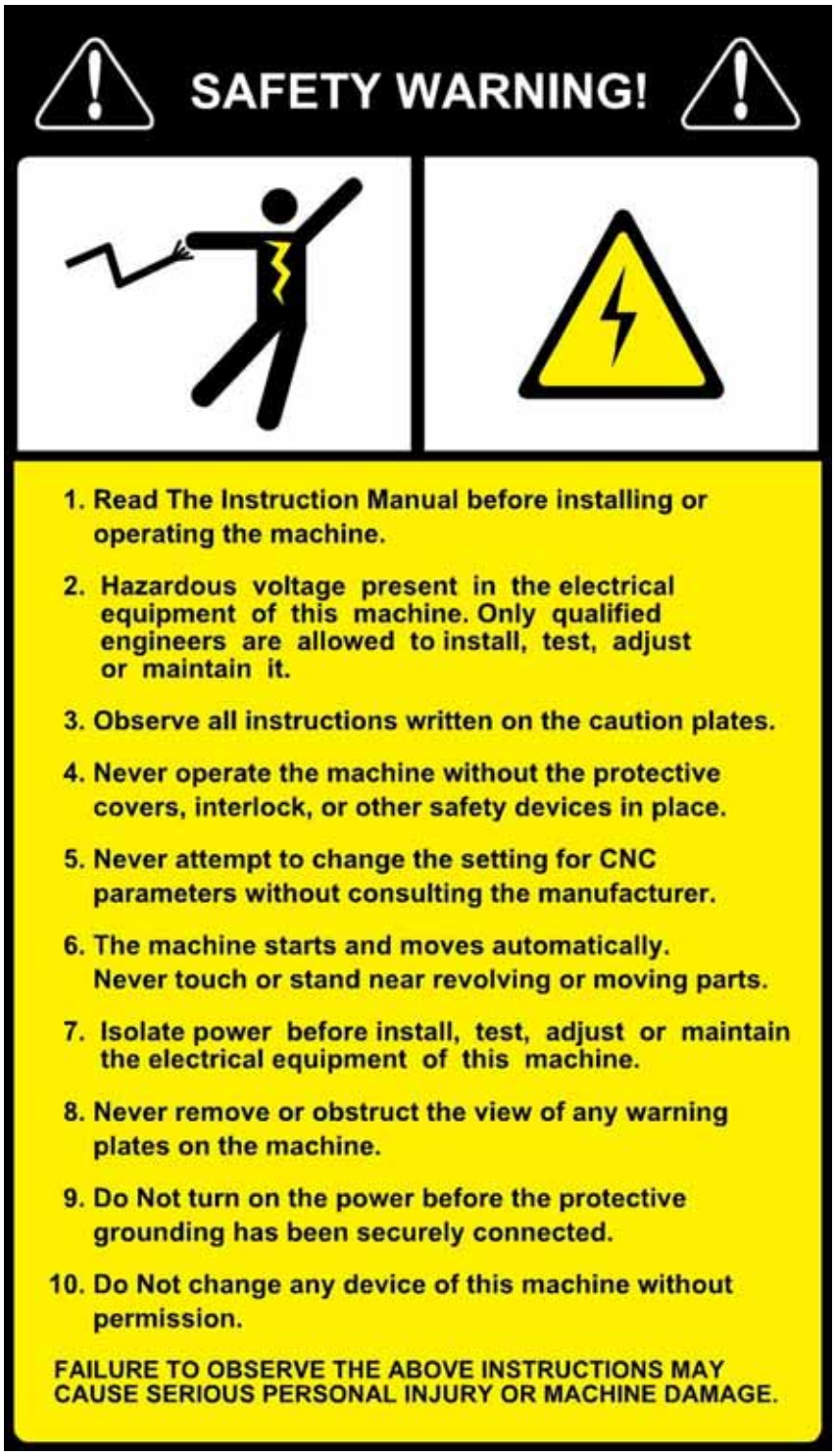
SAFETY WARNING!
1. Read The Instruction Manual before installing or operating the machine.
2. Hazardous voltage present in the electrical equipment of this machine. Only qualified engineers are allowed to install, test, adjust or maintain it.
3. Observe all instructions written on the caution plates.
4. Never operate the machine without the protective covers, interlock, or other safety devices in place.
5. Never attempt to change the setting for CNC parameters without consulting the manufacturer.
6. The machine starts and moves automatically. Never touch or stand near revolving or moving parts.
7. Isolate power before install, test, adjust or maintain the electrical equipment of this machine.
8. Never remove or obstruct the view of any warning plates on the machine.
9. Do Not turn on the power before the protective grounding has been securely connected.
10. Do Not change any device of this machine without permission.
FAILURE TO OBSERVE THE ABOVE INSTRUCTIONS MAY CAUSE SERIOUS PERSONAL INJURY OR MACHINE DAMAGE.

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Figure 3 Warning and danger signs on the machine (continued)

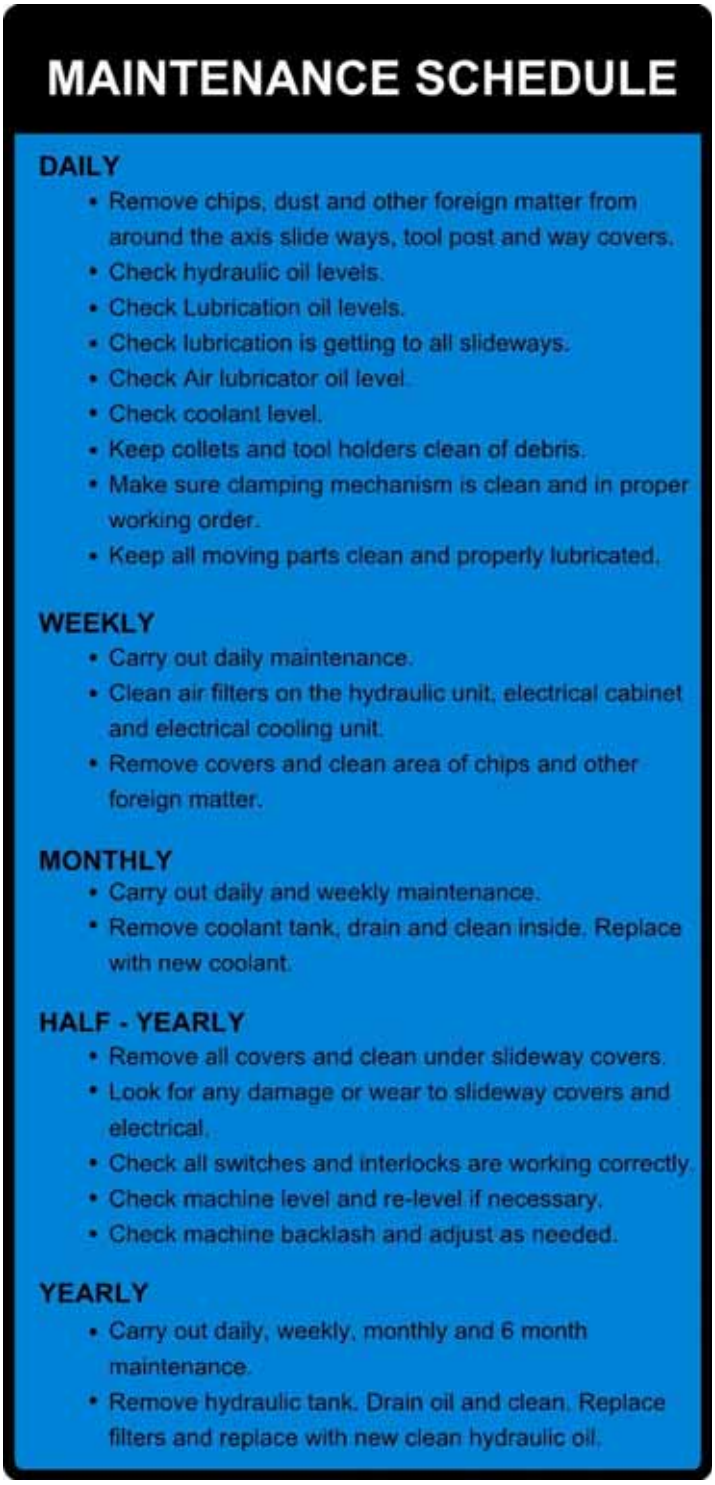
MAINTENANCE SCHEDULE
DAILY
• Remove chips, dust and other foreign matter from around the axis slide ways, tool post and way covers.
• Check hydraulic oil levels.
• Check Lubrication oil levels.
• Check lubrication is getting to all slideways.
• Check Air lubricator oil level.
• Check coolant level.
• Keep collets and tool holders clean of debris.
• Make sure clamping mechanism is clean and in proper working order.
• Keep all moving parts clean and properly lubricated.
WEEKLY
• Carry out daily maintenance.
• Clean air filters on the hydraulic unit, electrical cabinet and electrical cooling unit.
• Remove covers and clean area of chips and other foreign matter.
MONTHLY
• Carry out daily and weekly maintenance.
• Remove coolant tank, drain and clean inside. Replace with new coolant.
HALF - YEARLY
• Remove all covers and clean under slideway covers.
• Look for any damage or wear to slideway covers and electrical.
• Check all switches and interlocks are working correctly.
• Check machine level and re-level if necessary.
• Check machine backlash and adjust as needed.
YEARLY
• Carry out daily, weekly, monthly and 6 month maintenance.
• Remove hydraulic tank. Drain oil and clean. Replace filters and replace with new clean hydraulic oil.

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Figure 4 Warning and danger signs on the machine (continued)

⚠CAUTION

To ensure the spindle continues to run smoothly and have a long life, please run up the spindle as recommended below.

(1) Only run the spindle carrying a tool. Never run the spindle without tool. Please note the dynamical balance requirements of tools for high speed.

(O) (X)

(2) Procedure for warming up the spindle

	Situation	Spindle Speed (Max Speed= 100%rpm)	Time (Minute)	Check Items
A	Daily Running	30%	15	1. Any noise 2. Any abnormal vibration 3.Temperature rise less than 20°C
B	Spindle has been idled over 72hrs	1.30% 2.60%	15 15	1. Any noise 2. Any abnormal vibration 3.Temperature rise less than 20°C
C	Spindle has been idled over two weeks	1.25% 2.50% 3.65% 4.30% 5.100%	15 15 15 15 15	1. Any noise 2. Any abnormal vibration 3.Temperature rise less than 20°C

◎ **Please notice every step of the process. If the temperature rise exceeds 20%, then decrease the speed to 1000rpm**

◎ **If the speed exceeds 8000rpm, then the dynamical balance of the tool must below 2.5 μ**

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Figure 5 Warning and danger signs on the machine (continued)

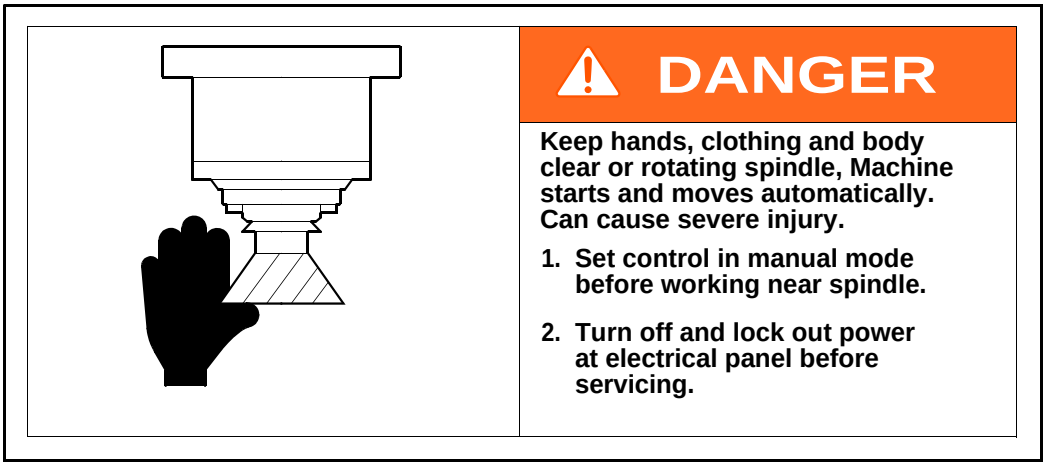
DANGER
Keep hands, clothing and body clear or rotating spindle, Machine starts and moves automatically. Can cause severe injury.
1. Set control in manual mode before working near spindle.
2. Turn off and lock out power at electrical panel before servicing.

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Figure 6 Warning and danger signs on the machine (continued)

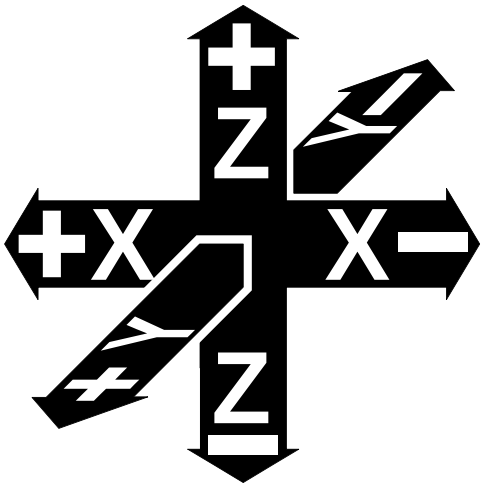

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Figure 7 Warning and danger signs on the machine (continued)

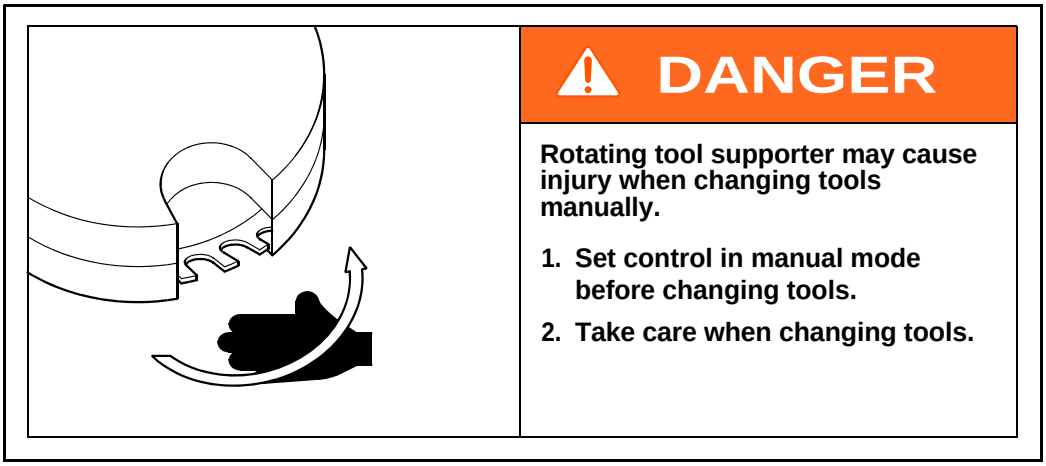
DANGER
Rotating tool supporter may cause injury when changing tools manually.
1. Set control in manual mode before changing tools.
2. Take care when changing tools.

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Figure 8 Warning and danger signs on the machine (continued)

NOTICE
Hold tooling with protected hand before pressing this green release button. Otherwise, the spindle, tooling, table and workpiece could be damaged.

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Figure 9 Warning and danger signs on the machine (continued)

CAUTION
1. Air pressure must be between 6 - 7kgs/cm²
(85psi-100psi).
2. Filter and Lubricator must be maintained once a week.
3. Recommended Air line – 12mm (1/2 inch).

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Figure 10 Warning and danger signs on the machine (continued)

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Figure 11 Warning and danger signs on the machine (continued)

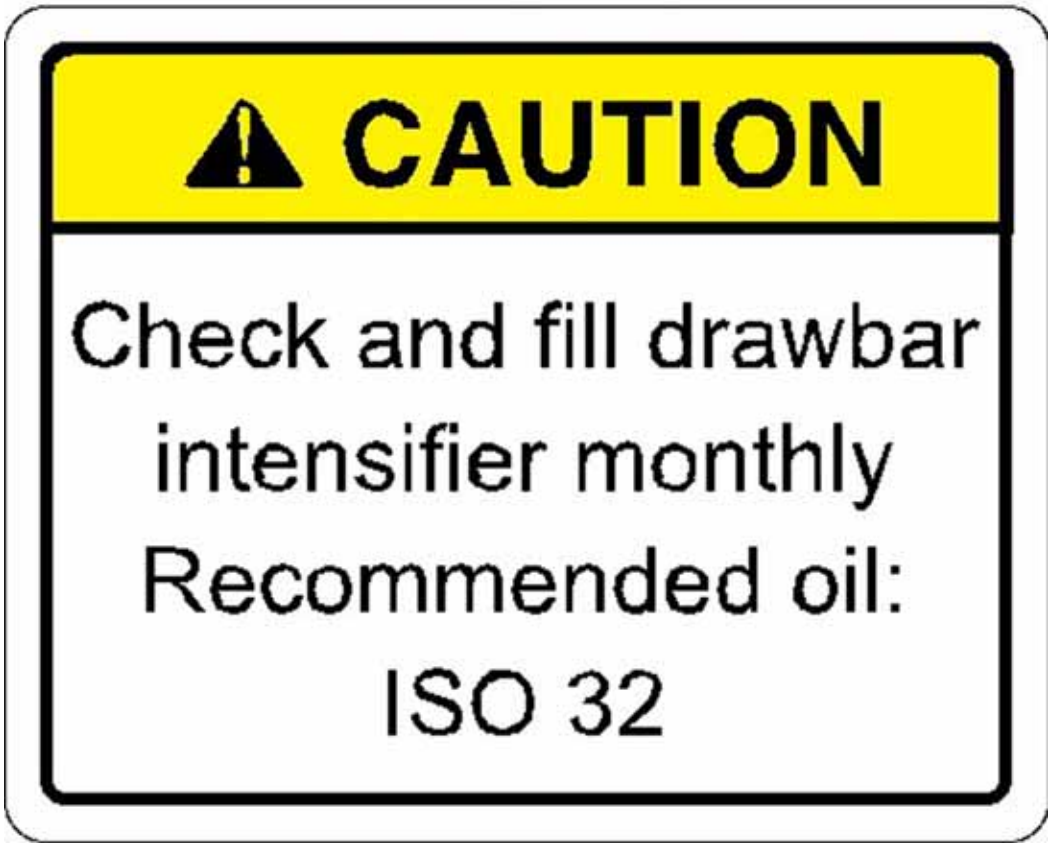

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Figure 12 Warning and danger signs on the machine (continued)

2.3 Safety Precautions

2.3.1 Operator Safety

The machine is intended to be used by trained and experienced operators.

Safety devices are installed in the machine to protect the operator from injury. The machine is fast and powerful, and can be dangerous if used under incorrect conditions.

Please read the following health and safety guidance notes to fully understand how to operate the machine before use.

WARNING - The machine is equipped with safety devices. Do not modify any safety devices on this machine. If changes to these safety devices are made, XYZ Machine Tools will not be responsible for any issues of product liability. Any changes will also invalidate any remaining warranty entitlement.

2.3.2 Health and Safety at Work

In accordance with the requirements of the EC Machinery Directive, this manual contains the necessary information to make sure that the machine tool can be operated correctly and safely. It is assumed that the operator is correctly trained, has the required skill and is approved to operate the machine, or, if undergoing training, is under the close supervision of a skilled and approved operator.

Sufficient information is also provided to ensure the machine is properly serviced and maintained by persons with the necessary skills and authority.

2.3.3 Noise Level

The noise level of this machine is less than 85dB(A). The noise level could be higher than 85dB(A) due to the environment the machine is installed in.

WARNING - When the noise level is high in the working environment, wear earplugs and appropriate personal protective equipment to prevent hearing damage.

2.3.4 Operating Hazards

When using the machine make sure you are aware of the following operating hazards.

2.3.4.1 Metal Cutting Fluids

Cancer of the skin can result from continuous contact with oil, particularly with straight cutting and soluble oils. Obey the necessary COSHH and risk assessments and make sure the following precautions are taken:

1. Avoid unnecessary contact with coolant.
2. Wear protective clothing.
3. Do not wear oil soaked or contaminated clothing.
4. After work, thoroughly wash all parts of the body that have made contact with oils.
5. Avoid mixing different types of oils.
6. Change oils regularly.
7. Dispose of oils correctly.
8. Always follow the manufacturer's instructions.

2.3.4.2 Variable Speed Drive

The machine is designed to allow fast and easy change of the spindle speed. Make sure the workpiece is secure and the maximum safe speed for the operation is not exceeded by setting the MAX RPM for each job.

2.3.4.3 Hazardous Areas

Keep away from the areas which have moving or rotating machine parts. Do not touch or reach over moving or rotating objects. The moving or rotating parts are shielded by guarding doors or covers and will cause serious injury if not used correctly. Understand the safety procedures before you use the machine. Be aware of potentially dangerous areas and obey warnings to avoid injury.

2.3.4.4 Machine Safety Guard

The machine is equipped with a fully-enclosed sheet metal enclosure guard. These guards are interlocked through the machine logic to all essential Health and Safety requirements of the EC Machinery Directive, necessary for CE marking.

WARNING - The machine is equipped with safety devices. Do not modify any safety devices on this machine. If modifications to these safety devices are made, XYZ Machine Tools will not be responsible for any issues of product liability. Any changes will also invalidate any remaining warranty entitlement.

2.3.5 Operational Safety Precautions

1. Do not use the machine without adequate lighting, or if the machine light is broken.
2. Clean any spillages from oil coolant etc., to eliminate slip hazards.
3. The floor area can become hazardous if water or oil is spilled. Make sure the floor is clean, dry and free from contamination.
4. Keep the machine and work area clean and tidy.
5. Make sure you have sufficient working space.
6. Keep all guards and cover plates in position and all machine cabinet doors closed.
7. Keep the working surfaces of the machine clear, where moving or rotating parts could make contact.
8. Do not touch or reach over moving or rotating machine parts.
9. Operate all switches carefully.
10. Before use, make sure you understand the function of each switch and how to use it.
11. Do not operate the machine in excess of its rated capacity.
12. Stop the machine immediately if anything unusual occurs.
13. Make sure you understand how to stop the machine before starting it.
14. Eye protection must be worn by all exposed persons and the operator of the machine. Do not rely on the Lexan Vision Panels for eye protection.
15. Reset the coordinates before operating the machine. It is not necessary to reset the common coordinates when personnel share the machine operation.
16. Electrically isolate the machine when leaving it unattended.

17. Do not operate the machine after consuming alcohol, taking strong medications or using non-prescription drugs.
18. Before operating the machine, remove all jewellery, neckties and any loose items of clothing.
19. Keep your hair away from moving parts. Where a risk exists, wear adequate head protection.
20. Wear safety shoes with oil resistant anti-skid soles and steel toe caps to protect your feet.
21. To protect your hands, stop the spindle and make sure that the CNC control is in the STOP mode:
    - Before changing tools.
    - Before changing components.
    - Before removing chips, swarf and coolant.

Note - Always use a chip scraper or brush to remove chips and swarf.

    - Before making adjustments or taking measurements.

22. Do not use compressed air to remove chips and swarf, or to clean the machine.

2.3.6 General Principles for Operator Safety when Operating the Machine

1. Do not wear jewellery, watches, ties or loose sleeved clothing.
2. Wear personal protective equipment when operating the machine.
    - Do not remove personal protective equipment when operating the machine.
    - Wear personal protective equipment correctly.
3. Always use the recommended or equivalent hydraulic oil, lubricant oil and grease.
4. Any working table installed adjacent to the machine must be secured to prevent the workpiece from falling onto the machine.
5. Make sure the machine has stopped and the power is isolated before replacing a fuse. Fuses must be replaced by a qualified electrician.
6. For fuse replacement, always use a fuse with the same specification.
7. Do not use other workholding devices without checking the machine for compatibility.
8. Do not touch the handset with wet hands as this may cause an electric shock.
9. Do not touch the electrical equipment and operating panel with wet hands as this will cause an electric shock.
10. Do not clamp a workpiece contaminated with grease or oil.
    - Clamp all workpieces.
    - Do not operate the machine until the workpiece is correctly clamped.
    - Do not clamp workpieces that exceed the specification of the machine.
    - Use correct handling technique when installing or removing components, vices etc. to the machine.

11. Remove oil and grease from hand tools, levers and handles.
12. For safe operation, make sure there is enough texture on the surface of the hand tool or lever handle.
13. Hold hand tools and lever handles correctly.
    - Always select the correct hand tool and applicable grip position on the lever handle.
    - Do not use hand tools or lever handles in difficult positions.
    - Do not apply excessive force to hand tools or lever handles.
14. Hold hand tools and lever handles in the recommended holding position.
15. Do not use broken, chipped or defective tools.
16. Make sure the workpiece is correctly clamped in a vice or other holding device.
17. Be careful of irregular workpieces when clamping.
18. Be careful if large burrs exist on workpieces.
19. Select the correct tool for the job.
20. Wear gloves when handling a sharp tool.
21. Pay attention when changing the tool to ensure the tool is not dropped.
22. Do not leave the machine unattended.
23. Do not use tools without handles.
24. Do not rush when operating the machine.
25. Do not use alternative tools if the correct sized tool is not available or cannot be located in the workshop.
26. Do not open the guards while the machine is in operation.
27. Do not put any part of your body in the path of moving objects.
    - Be careful of moving machine parts that can fall.
    - Make sure you are aware of where you are moving your hands or body in relation to the machine.
    - Make sure your hands or other parts of the body are not in a position to be hit by the spindle or workpiece.
28. Understand the function of all controls.
29. Do not put your hands on a spindle or workpiece when it is in motion.
30. Make sure power is isolated when the machine is not in use.
31. Do not start the spindle with the tool key in the tool.
32. Do not get distracted when operating the machine.
33. Be careful of machine hazards when attending to other features of machine operation.
34. Keep long hair and loose clothing away from the rotating parts of the machine.
35. Make sure the spindle is not in operation when using gauges on the machine.
36. Be careful of material and tool ejection from the machine.

37. Do not leave tools in the machine during setup.
38. Do not reach over, under or around a workpiece to make an adjustment when the spindle and workpiece are in motion.
39. Do not reach over, under or around a workpiece to retrieve any item.
40. Do not reach over, under or around a workpiece to tighten a machine part.
41. Do not reach over, under or around a workpiece to move a hand tool to a different position.
42. Do not reach over, under or around a workpiece to remove swarf.
43. Understand the correct procedure for applying loads. Do not apply force from a difficult position.
44. Do not install a workpiece which is too large for the machine.
45. Do not install a workpiece, which is too large for the operator to handle, without lifting equipment.
46. Use the correct equipment for handling workpieces.
47. Secure all workpieces.
48. Secure all jaws, nuts, bolts and blocks.
49. Use the correct equipment.
50. Do not take cuts more than the machine's capability.
51. Use the correct hand tool to remove swarf.
    - Do not rush to remove swarf.
    - Be careful of swarf wrapped around the spindle or workpiece.
52. Do not change the original setting parameters unless instructed by XYZ Machine Tools personnel. Keep a record of the original setting values before change.
53. Do not block or remove any warning signs or information plates. Please contact XYZ Machine Tools or our local dealer to purchase replacement signage if they become damaged.
54. Disconnect the isolator of the main power immediately if the power supply is unstable.

2.3.7 Safety Precautions for Operating the Centralized Lubrication System

2.3.7.1 Prior to Installation.

- Prior to installation of the centralized lubrication system, refer to Section 5.6.1 of this manual for the correct connection of the power.
- Make sure the correct electrical specification is adhered to.
- Do not use the centralized lubrication system for any other function except lubrication of the machine with oil.

2.3.7.2 Prior to filling the centralized lubrication system with oil.

Caution - Only fill the centralized lubrication system with new oil.

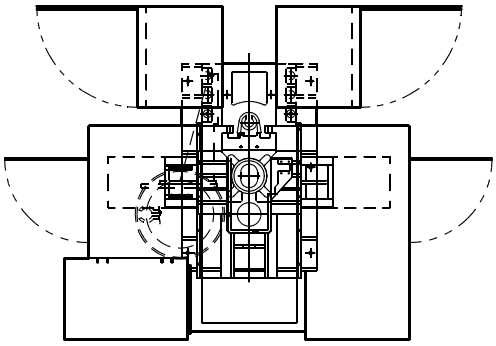
- Only use ISO 32 Oil.
- Do not fill the centralized lubrication system with chemical substances or water.
- Remove all particles and dirt from the oil tank to maintain the correct lubrication.
- Do not spill oil on the display and control panel when filling the oil tank.

2.3.7.3 Safety precautions for the centralized lubrication system control panel.

- Make sure the control panel does not come in contact with water or oil.

2.3.7.4 If a failure occurs in the centralized lubrication system, only XYZ Machine Tools are approved to repair the centralized lubrication system.

3.0 Description



Item	Nomenclature
1	HEAD
2	MAIN COLUMN
3	BED BASE
4	WORKING TABLE
5	SADDLE
6	SHIELD COVER
7	COOLANT TANK
8	TOOL MAGAZINE
9	CHIP CONVEYOR
10	OPERATION PANEL
11	ELECTRICAL CABINET

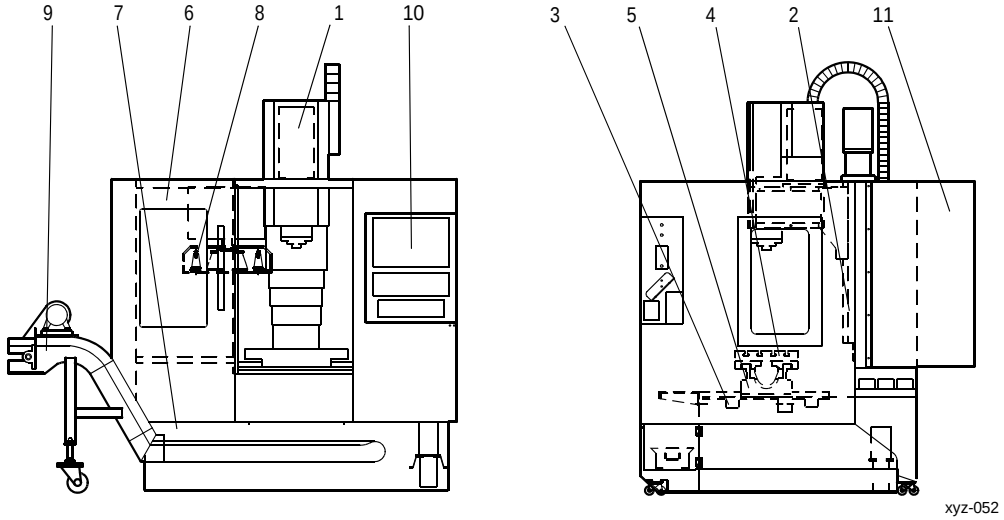


Figure 13 Mini Mill 560 main parts

The machine consists of:

- Head
- Main column
- Bed base
- Working table
- Saddle
- Shield cover
- Coolant tank
- Tool magazine
- Chip conveyor (optional equipment)
- Operation panel
- Electrical cabinet

3.1 Vertical Machining Center Specifications

The machine has a:

- Head assembly
- Feed-motion transmission mechanism
- Y and Z axis cable carrier
- Automatic Tool Change (ATC) mechanism
- Fully-enclosed sheet metal enclosure

3.1.1 Standard Equipment

- Adjustable levelling screws and pads
- Solid square slideway construction
- Automatic lubrication system
- Flood coolant
- CNC controller system
- Full enclosed machine guard
- Rigid induction hardened slides
- Halogen working light
- Spindle air blast
- Steel slideway covers on all axes
- Tool Box
- 12/24 station carousel
- Three axes AC servo motor
- Precision ground ballscrews
- Air purge system

- Electronic handwheels
- Automatic power off

3.1.2 Optional Equipment

- 12000 rpm spindle
- Spindle oil cooler
- 4th axis rotary table
- Swarf conveyor
- Chip auger
- Table and spindle probes

3.1.3 Machine Specifications

	XYZ 560 MINI MILL	XYZ 710 VMC
X Travel	560 mm	710 mm
Y Travel	400 mm	450 mm
Z Travel	500 mm	500 mm
Table size	610 x 370 mm	760 x 430 mm
Spindle centre to column	455 mm	492 mm
Spindle to table	100 - 600 mm	100 - 610 mm
Column front to table centre	340 mm - 740 mm	492 mm
Rapid feed XYZ axis	20 M/min Box Way	20 M/min Box Way
Cutting feed rates	1 - 20000 mm/min	1 - 20000 mm/min
Max table load	300 kg	500 kg
T slot size	16 mm	16 mm
T slot number & pitch	4 @ 80 mm	4 @ 100 mm
Spindle speed	5 - 8000 rpm	5 - 8000 rpm
Spindle motor	15 hp	20 hp
Spindle taper	BT 40	BT 40
Tool magazine capacity	12 station	24 station
Tool change time *tool to tool*	8 sec	2.5 sec
Max tool diameter	100 mm	80 mm
Max tool weight	7 kg	7 kg
Coolant capacity	180 L	160 L
Ball screw size (grade C3)	32 mm P8	32 mm P8
AC servo motor size	X and Y 8 Nm, Z 12 Nm	X and Y 8 Nm, Z 12 Nm
Machine weight	3100 kg	4000 kg
Footprint W x D x H	2000 x 2060 x 2530 mm	2250 x 2220 x 2550 mm

Note - Specifications and dimensions are subject to change without prior notice.

3.1.4 Standard Dimensions

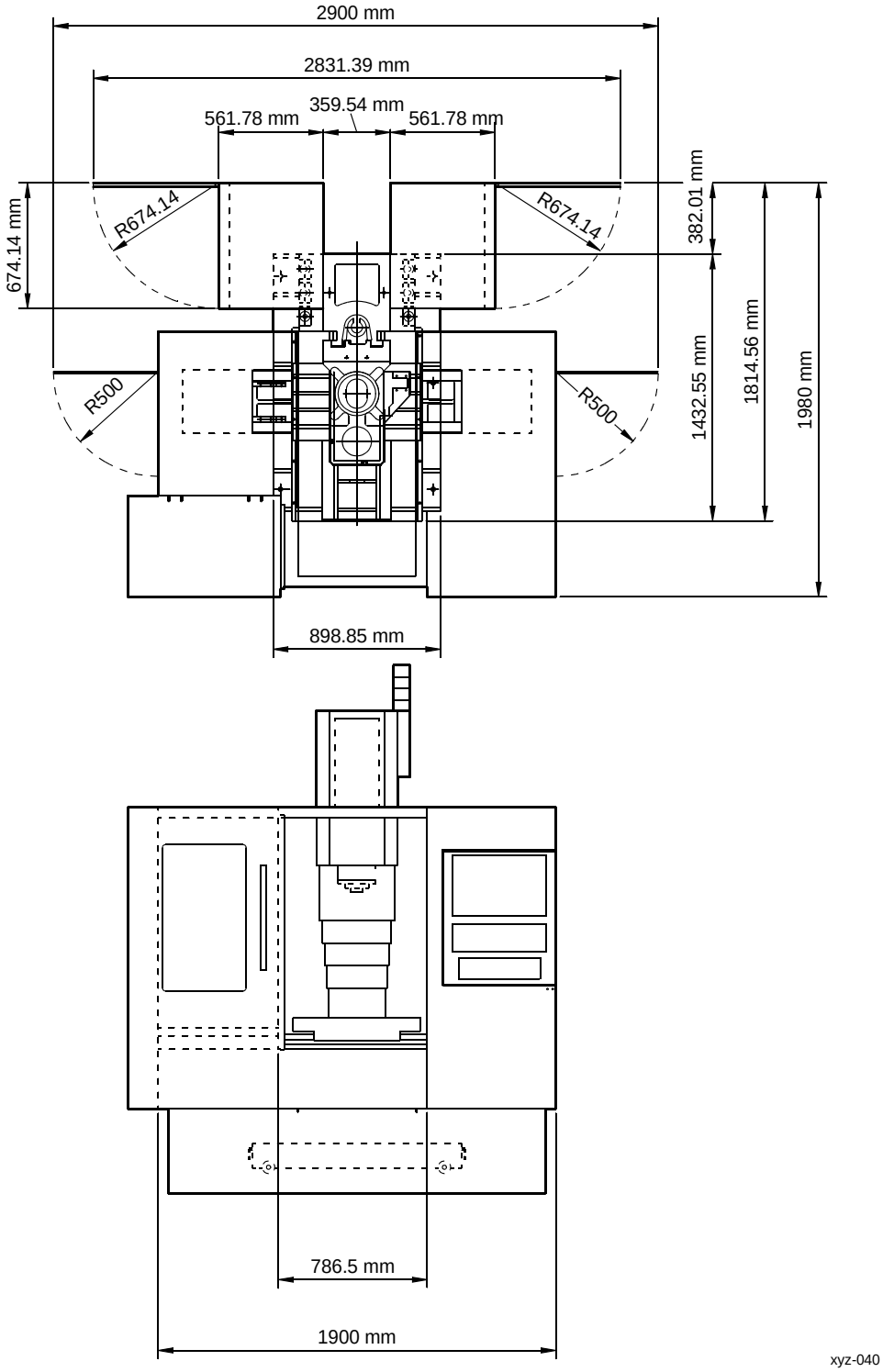


Figure 14 560 Mini Mill standard dimensions

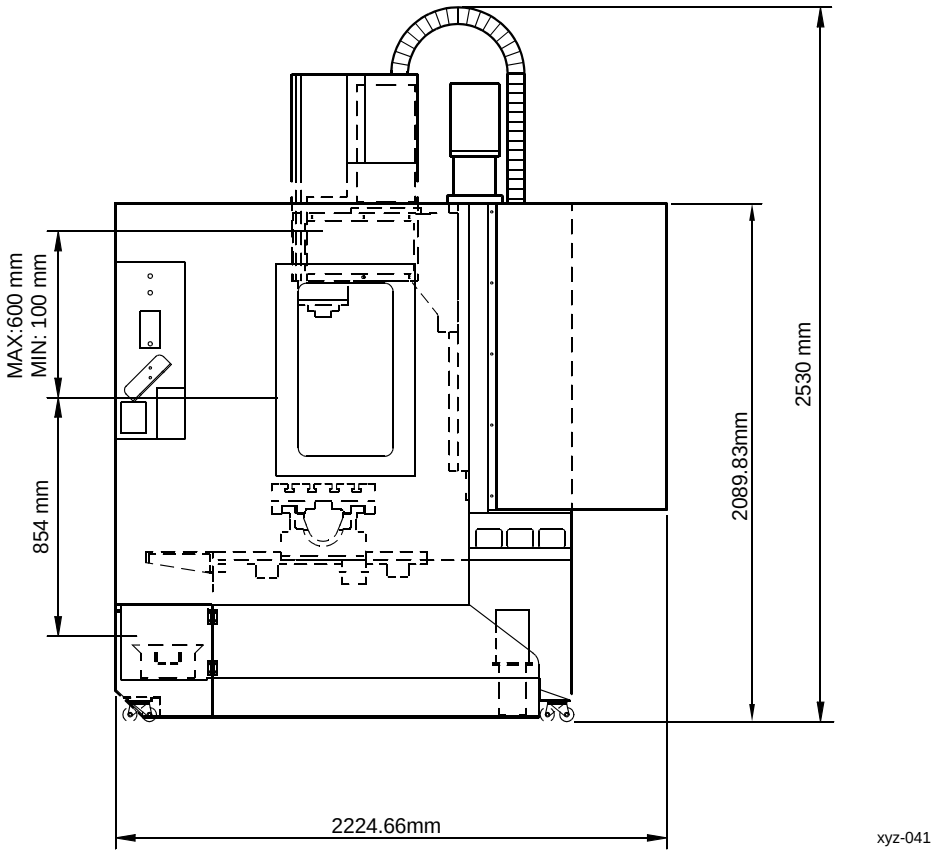


Figure 15 560 Mini Mill standard dimensions (continued)

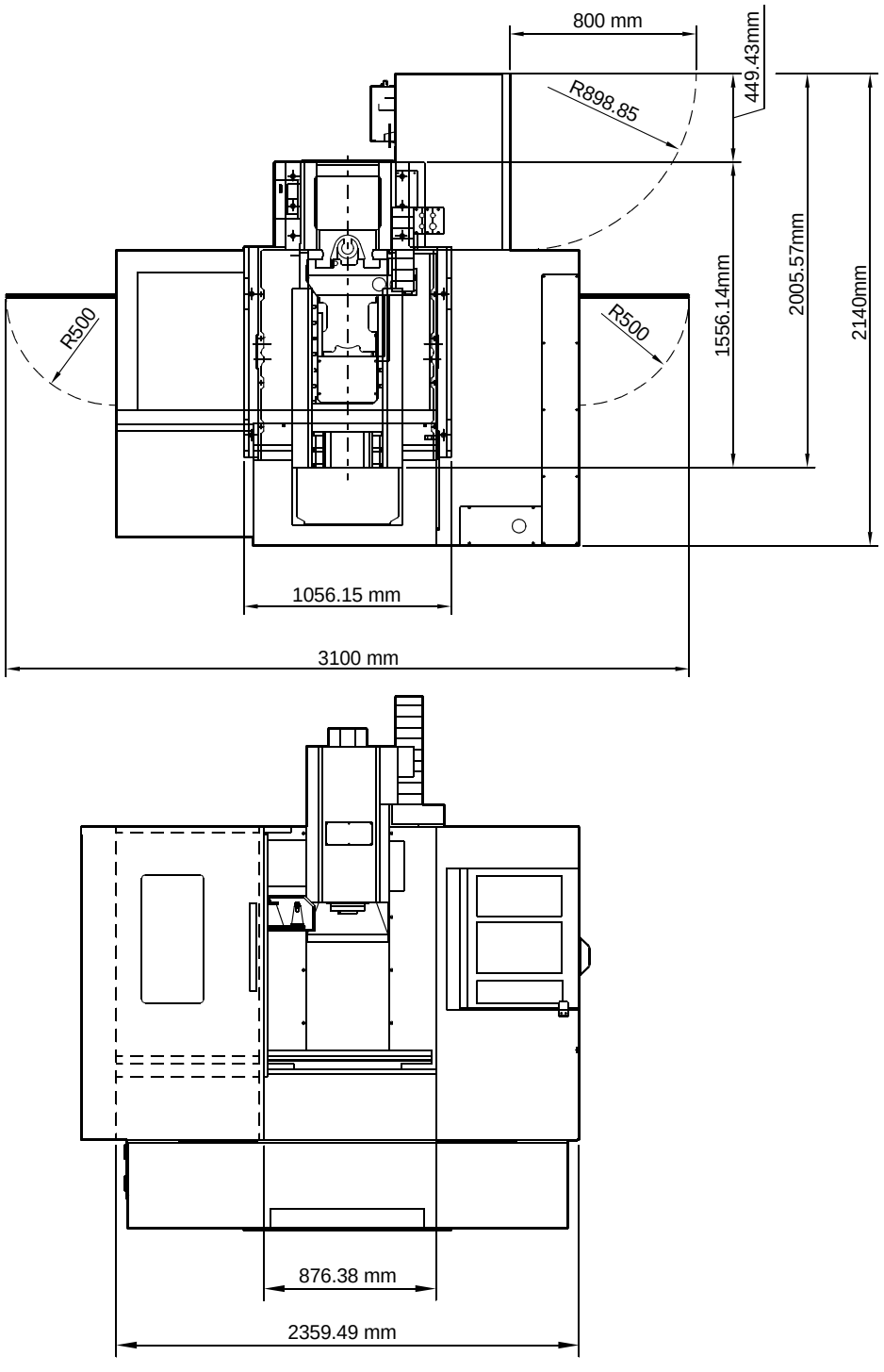


Figure 16 710 Vertical Machining Center standard dimensions

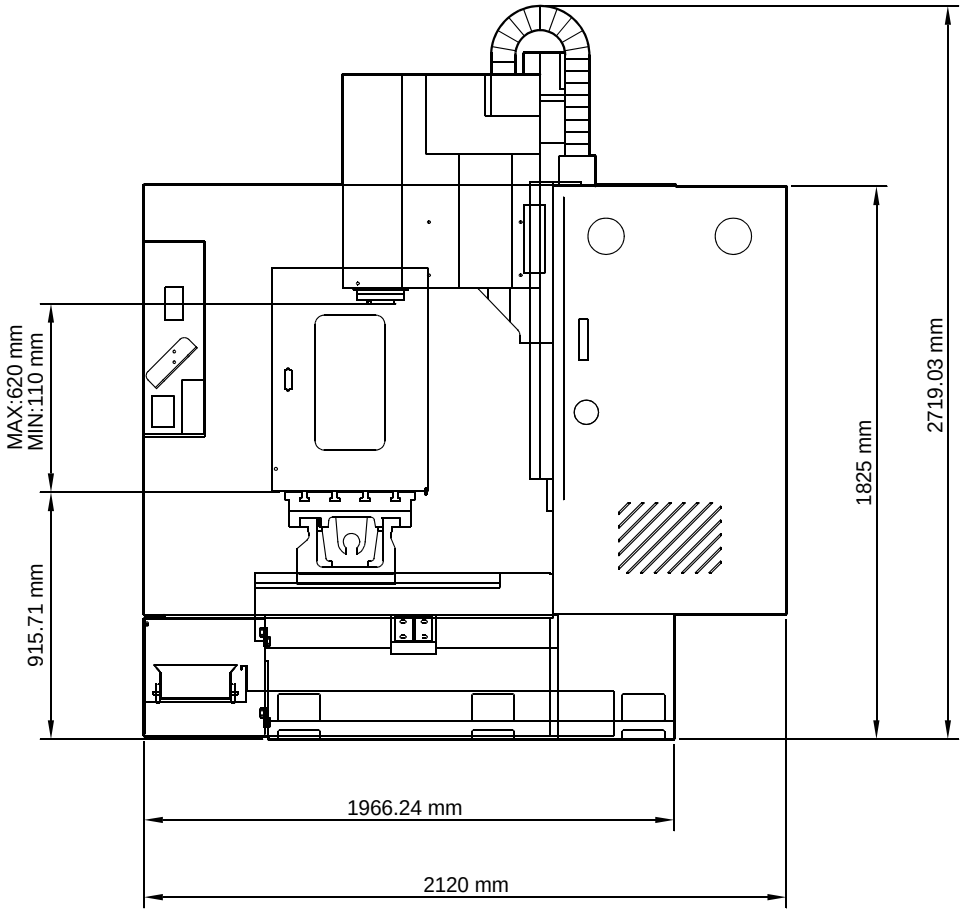


Figure 17 710 Vertical Machining Center standard dimensions (continued)

3.1.5 Dimensions (with Chip Conveyor)

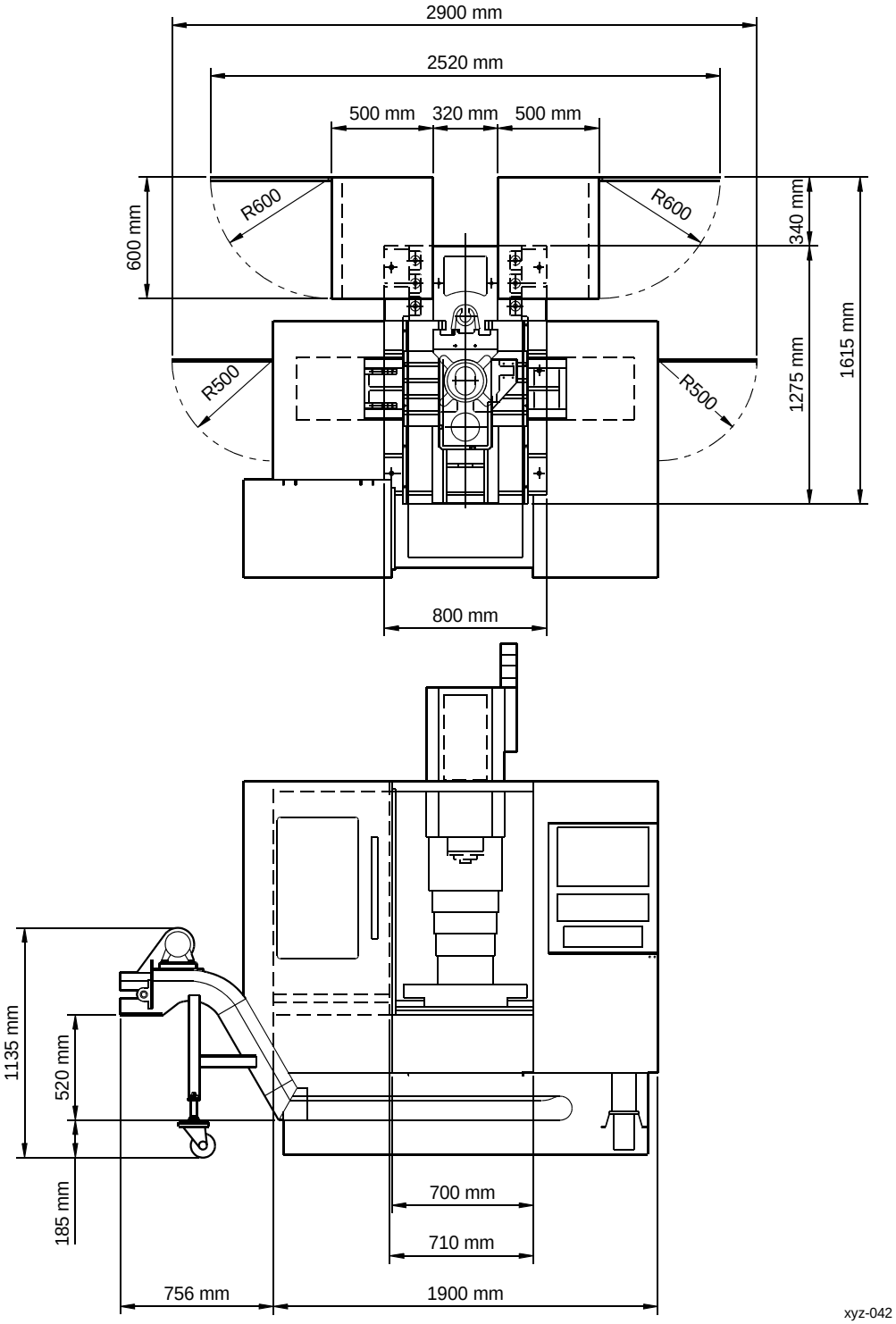


Figure 18 560 Mini Mill dimensions with chip conveyor

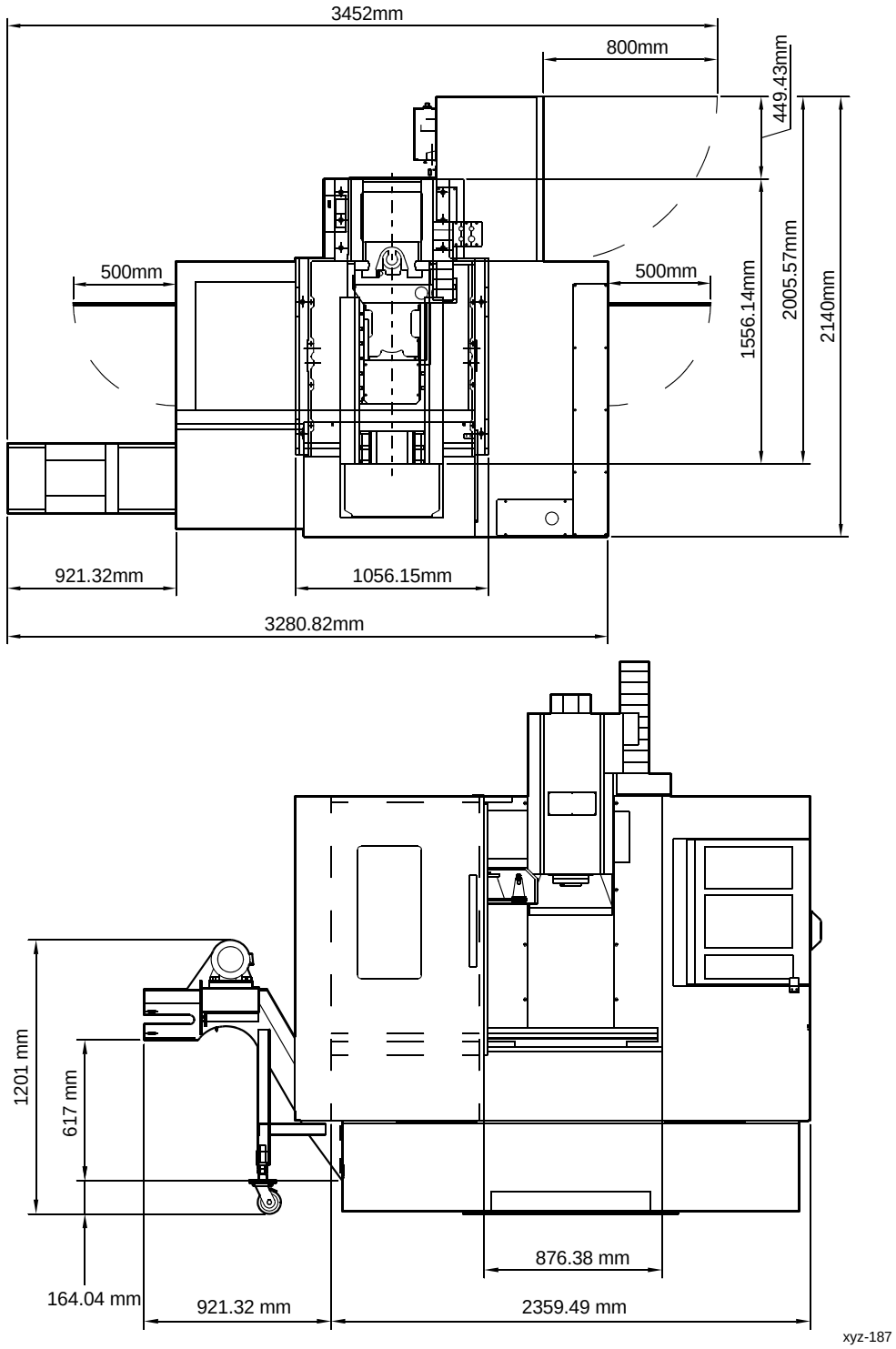


Figure 19 710 Vertical Machining Center dimensions with chip conveyor

3.1.6 Head Assembly

3.1.6.1 Power Transmission Mechanism

The spindle motor drives the spindle through belts and pulleys. Tool clamping and unclamping is done through the use of a disk spring, draw bar, and a pneumatic system.

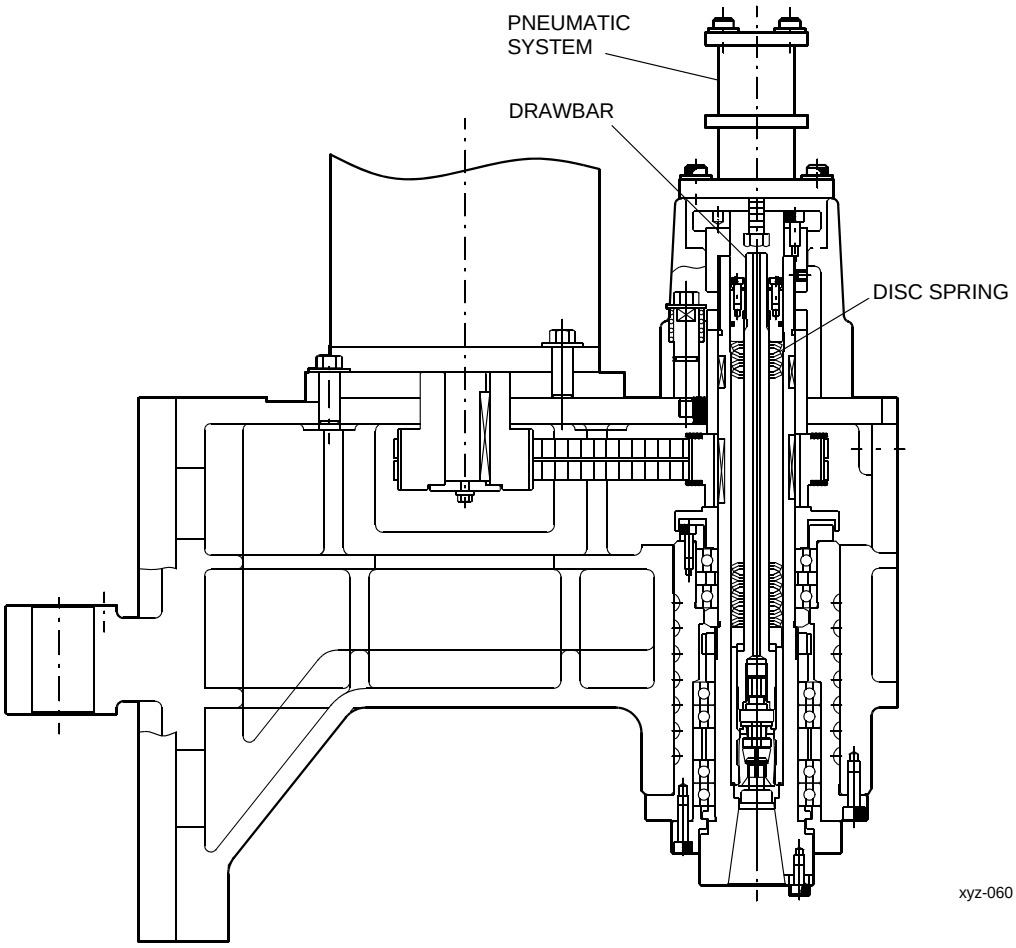


Figure 20 Power transmission mechanism

3.1.6.2 Tool Clamping and Unclamping Mechanism

The disc spring applies a clamping force of approximately 800 kgf. To grip the tool holder, the draw bar is pulled up by the disc spring set which pulls the tool retention knob upwards. To release the tool, the retention knob is released pneumatically. A stream of compressed air blows through to clean the taper hole and tool.

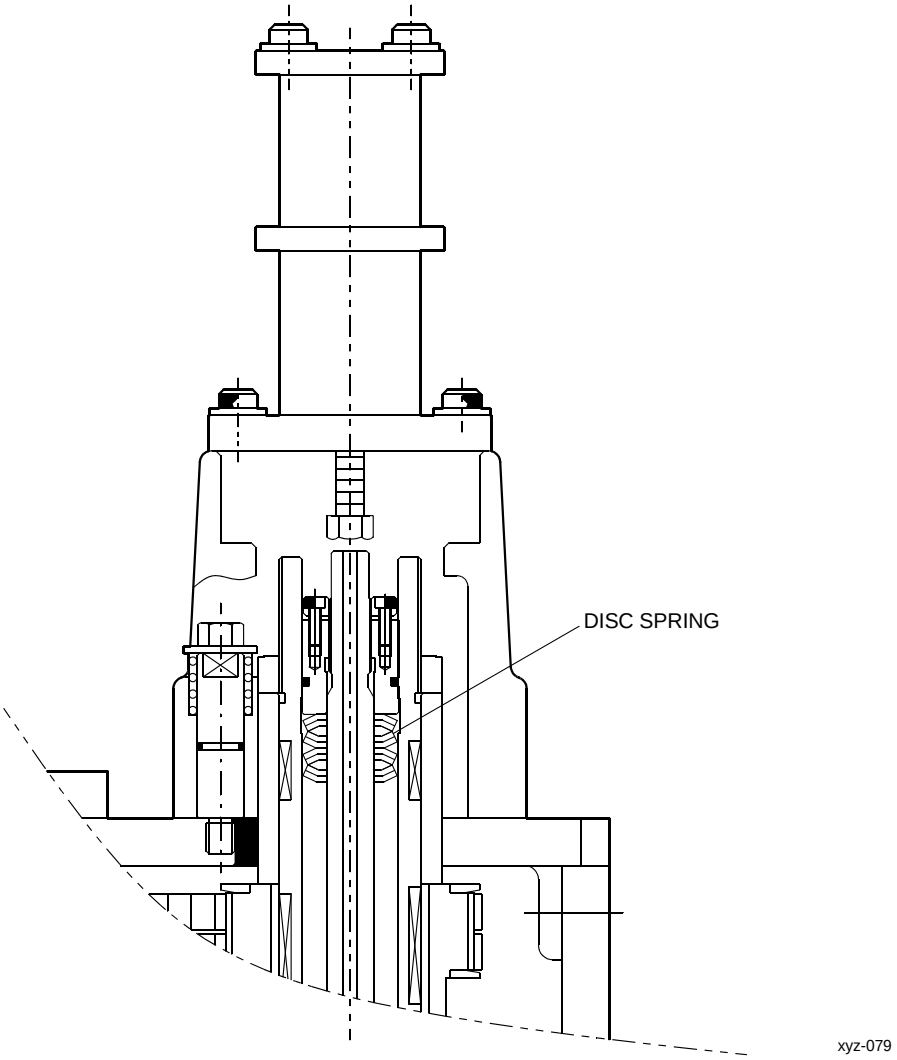


Figure 21 Tool clamping and unclamping mechanism

3.1.6.3 Spindle Positioning Mechanism

A sensor tracks the spindle rotation motion and feeds the positioning signal to the spindle motor controller which accurately controls the spindle position.

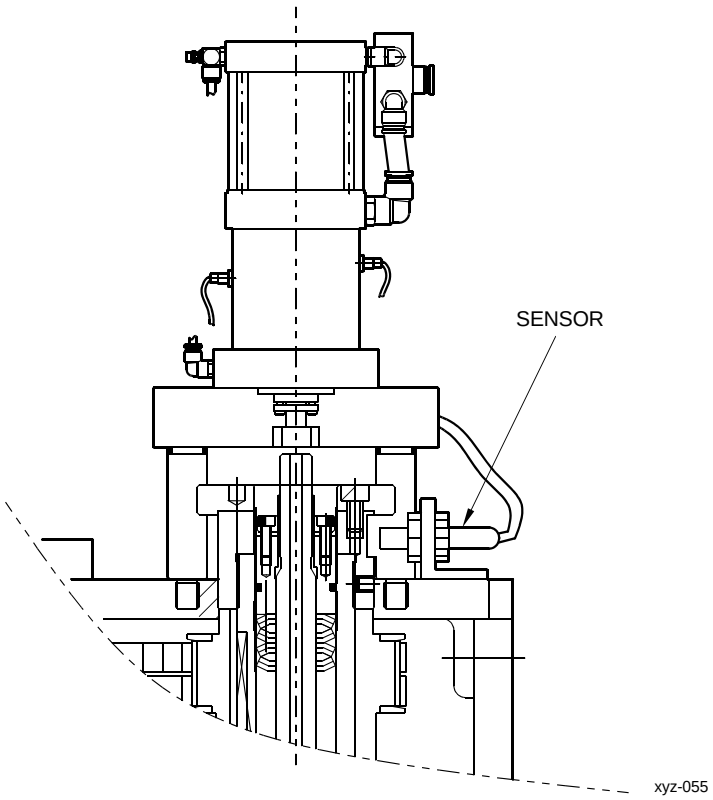


Figure 22 Spindle position mechanism

3.1.7 Feed Motion Transmission Mechanism

The encoder monitors the position of the feed motion in a semi-closed loop. You can, however, select linear scales if installed (optional part), which is a fully closed control loop.

3.1.7.1 X-Axis Feed-motion Transmission Mechanism

The table sits on the guide rails of the saddle and is driven by the AC servo motor through the connection of a coupling and a ballscrew.

Limit switches stop the saddle from over-travelling. When the working table travels over the limit, the positioning blocks operate the limit switch on the saddle. The limit switch transmits the over-limit signal to the AC servo motor's controller to stop the feed motion.

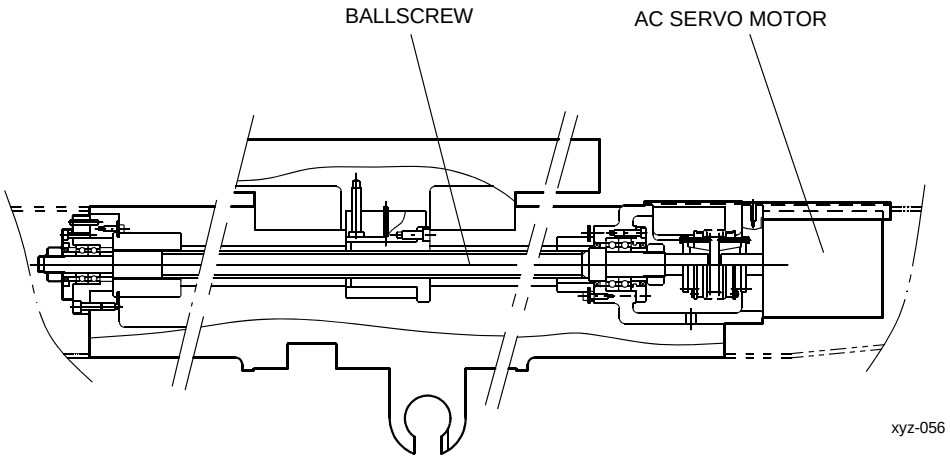


Figure 23 X Axis feed-motion transmission mechanism

3.1.7.2 Y-Axis Feed-motion Transmission Mechanism

The saddle sits on the guide rails of the bed base and is driven by the AC servo motor through the connection of a coupling and a ballscrew.

Limit switches stop the saddle from over-travelling. When the working table travels over the limit, the positioning blocks operate the limit switch on the saddle. The limit switch transmits the over-limit signal to the AC servo motor's controller to stop the feed motion.

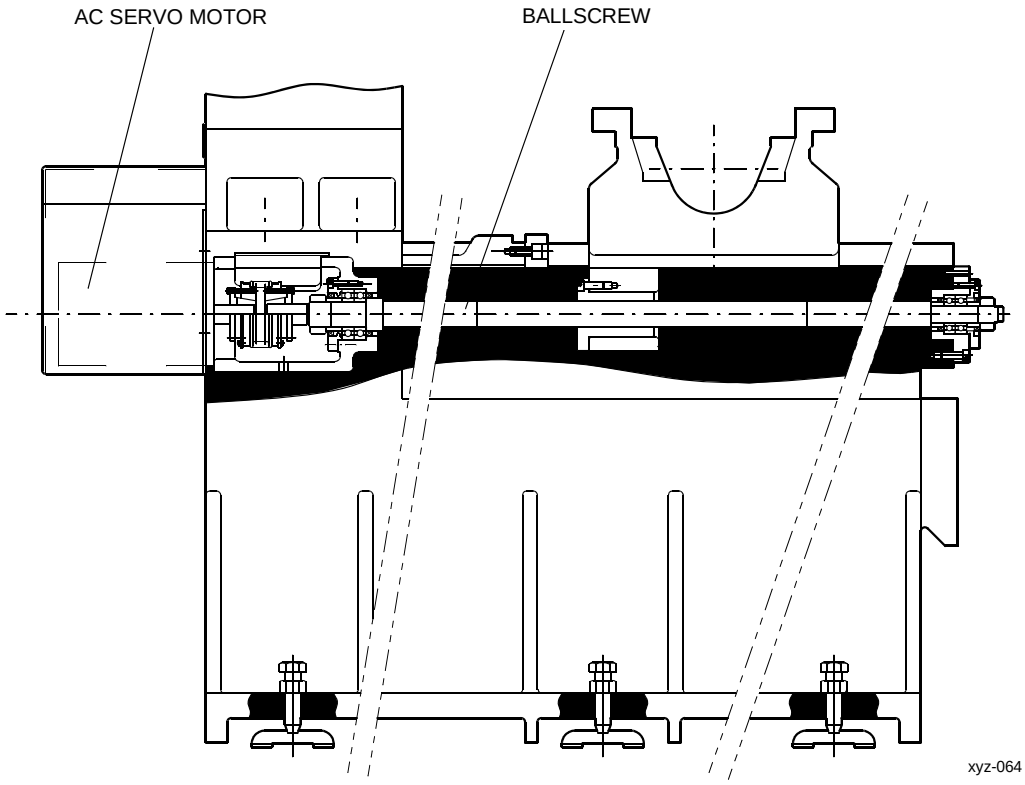


Figure 24 Y Axis feed-motion transmission mechanism

3.1.7.3 Z-Axis Transmission Mechanism

The headstock sits on the guide rails of the main column and is driven by the AC servo motor through the connection of a coupling and a ballscrew.

The maximum travelling range in the Z direction is 500 mm. Limit switches stop the headstock from over-travelling. When the headstock travels over the limit, the positioning blocks operate the limit switch on the headstock. The limit switch transmits the over-limit signal to the AC servo motor's controller to stop the feed motion.

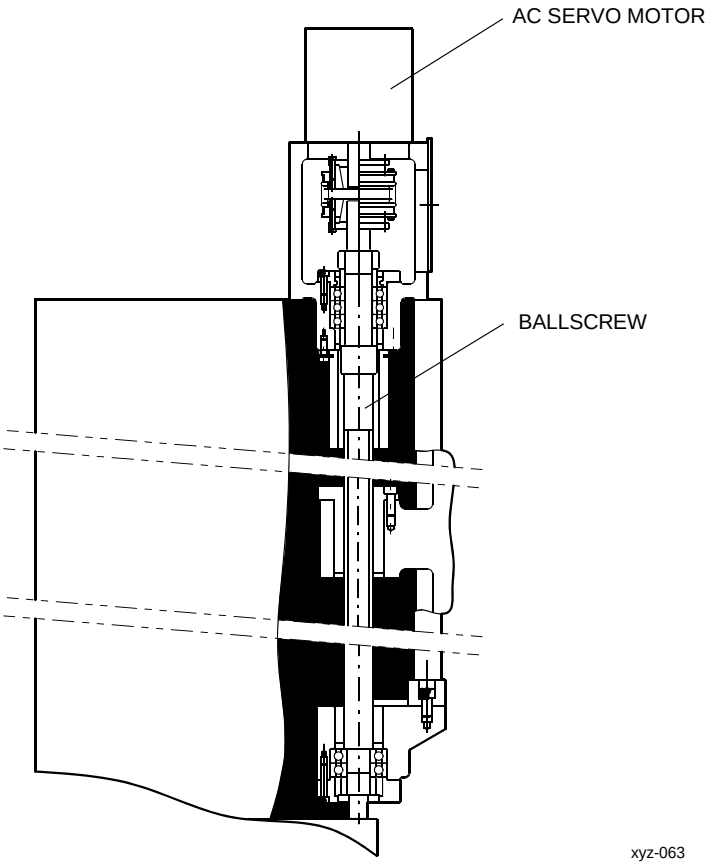


Figure 25 Z Axis transmission mechanism

3.1.7.4 Y and Z Axis Cable Carrier

All the electrical wires and oil hoses that connect between the saddle and guard pass through the Y-axis cable carrier and connect to connectors located on the saddle.

All the electrical wires, air hoses and oil hoses that connect between the headstock and the electrical cabinet pass through the Z-axis cable carrier and connect to connectors located on the head.

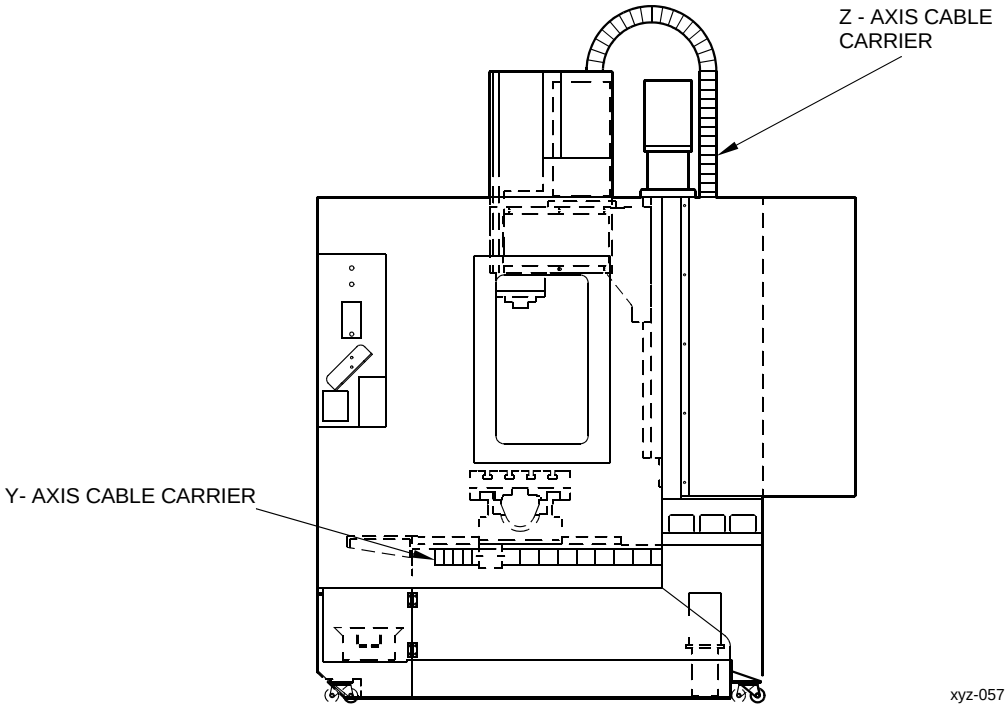


Figure 26 Y and Z axis cable carrier (xyz-057)

3.1.8 Automatic Tool Change (ATC) Mechanism (560 Mini Mill)

The pneumatic system and proximity switch is used to select tools.

As the tool exchange command is issued, the swivel disk rotates to the selected tool position according to NC or manual commands. A proximity switch connected to the electrical motor controls the magazine's positioning. When the selected tool reaches the target location, the electrical motor stops immediately. The air cylinder moves the tool magazine.

The rotation direction could be either clockwise or anti-clockwise.

The tool is selected randomly based on the shortest path. This minimizes the tool selection time.

3.1.8.1 Armless Carousel ATC Mechanism (710 VMC)

An electrical motor drives the tool magazine through the gear that rotates the swivel disk.

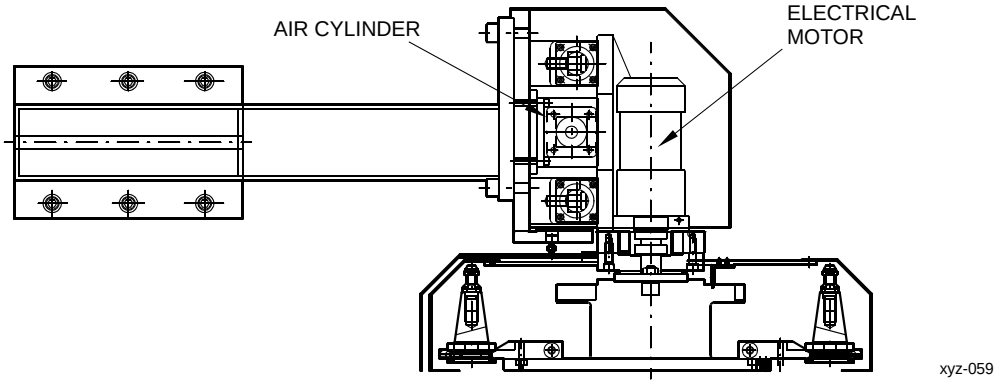


Figure 27 Armless carousel ATC mechanism

3.1.8.2 Arm Type ATC Mechanism

An electrical motor drives the tool magazine through the cylindrical cam that drives the roller on the swivel disk that rotates the swivel disk. The cylindrical cam has both the transmission and positioning functions.

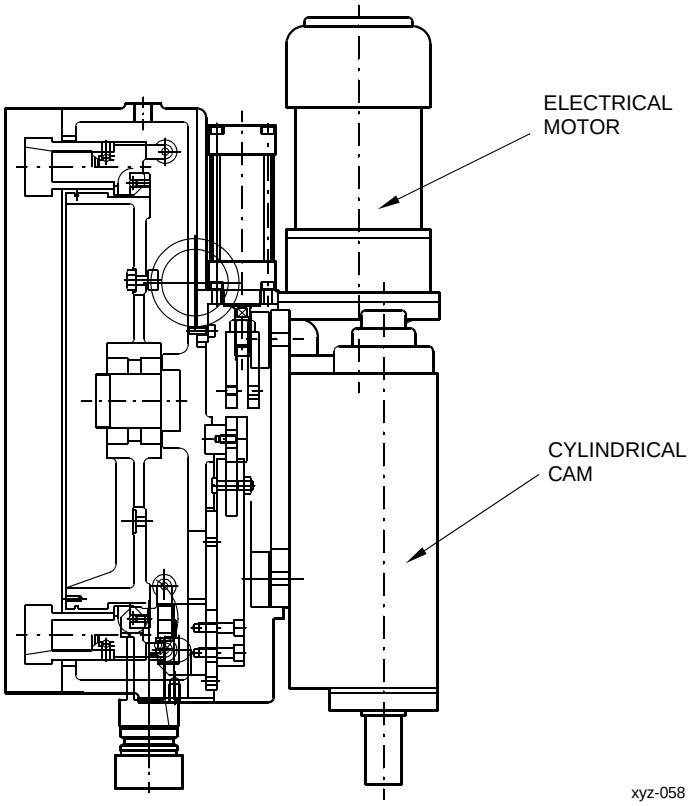


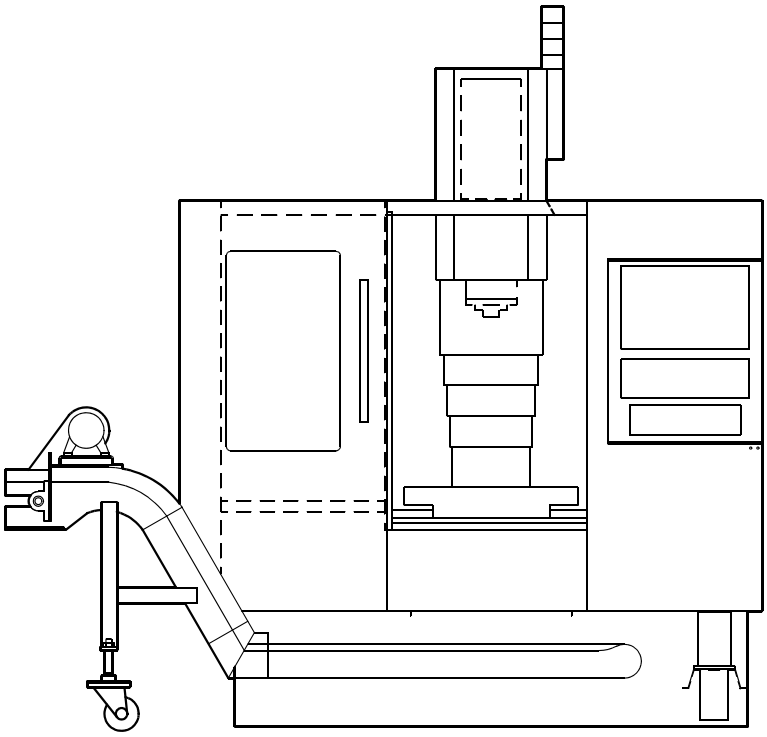
Figure 28 Arm type ATC mechanism

3.1.9 Enclosure

The fully enclosed sheet metal enclosure is designed to protect the operator from the running machine, moving parts, cutting coolant and any swarf generated. Swarf is conveyed through the swarf conveying tunnel to the swarf collection bucket. The circulating cutting coolant is pumped through the coolant filters to the coolant distributors.

The sheet metal enclosure has a one-piece front door so that you can inspect the machine or install the workpiece easily.

WARNING - Make sure the machine has fully stopped before opening the one-piece door. If the door is opened during operation the machine stops to protect the operator from debris, cutting coolant and moving parts. Make sure you close the one-piece front door before you start the machine.



xyz-061

Figure 29 Enclosure (xyz-061)

3.1.10 Dimensions of the Tool Holder

3.1.10.1 BT-40 and CT-40 Specification

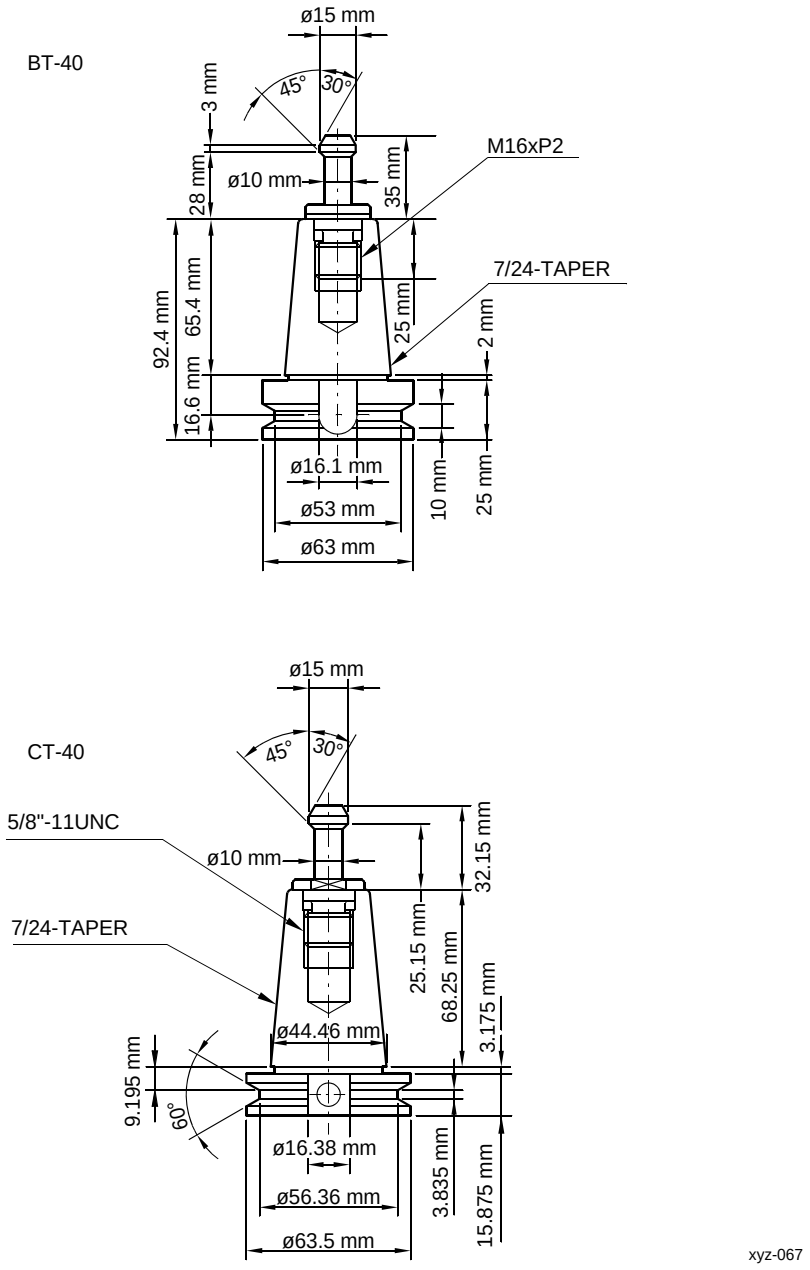


Figure 30 BT-40 and CT-40 specification

3.2 Rotary Type Tool Changer Specifications

No	Item Description	Specification
1	Maximum diameter	75 mm
2	Maximum length	300 mm
3	Maximum clamping force	8 kg
4	Moving time between tool pocket	0.3 sec/pocket
5	Tool capacity	16 20 24
6	Tool weight (does not include changer)	450 kg
7	Gap between tool pockets	77.01 mm
8	Tool changing angles	65° 25°

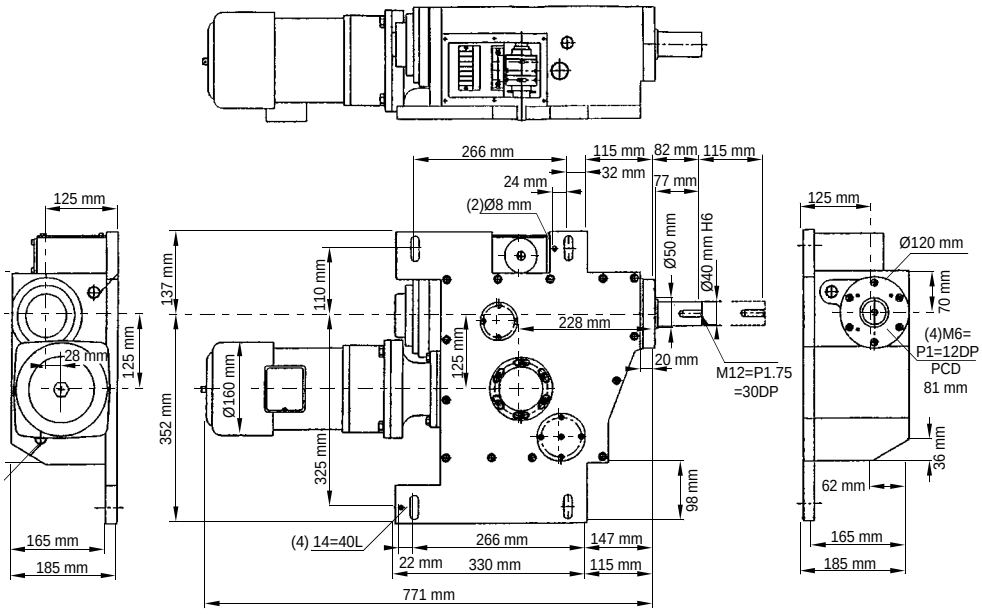


Figure 31 Rotary type tool changer specifications

3.3 Centralized Lubrication System Specifications

1	Electrical specification for POWER port	11 / 220 - 240 VAC 50 or 60 Hz
2	Electrical specification for ALARM ports	6 A @ 220 VAC 10 A @ 120 VAC 6 A @ 30 V DC
3	Fuse at power input	3.5 A for 110 VAC 1.3 A for 220 - 240 VAC
4	Maximum power	100 W
5	Permissible operating viscosity	0.03 - 0.25 Pa S (30 - 250 cSt)
6	Discharge rate	200 c.c./min for YET-C1 model 100 c.c./min for YET-C2 model
7	Maximum discharge pressure	5 ± 1 bar for YET-C1 model 15 ± 1 bar for YET-C2 model
8	Diameter of elbow joint	4 mm or 6 mm
9	Dimension	W 225 mm x D 167 mm x H 297 mm
10	Oil tank capacity	3, 6, 8 or 20 Litres (0.66, 1.32, 1.76, or 4.4 UK Gal)
11	Operating temperature	0 - 50°C
12	Operating range for pressure sensor (bar)	2 - 4 bar for YET-C1 model 10 - 12 bar for YET-C2 model

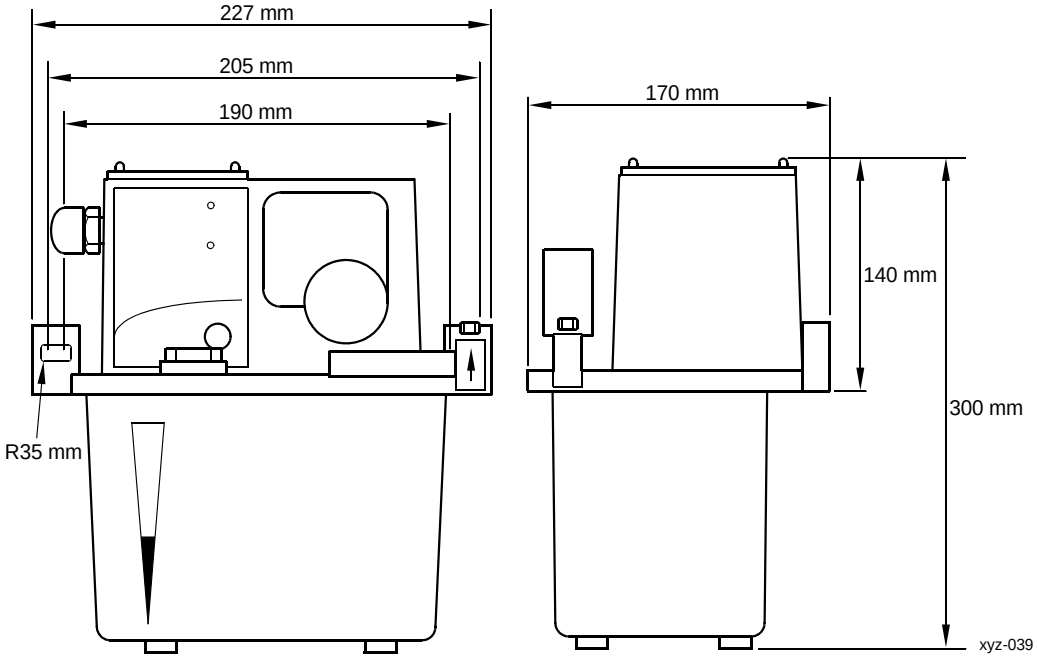


Figure 32 Centralised lubrication system specifications

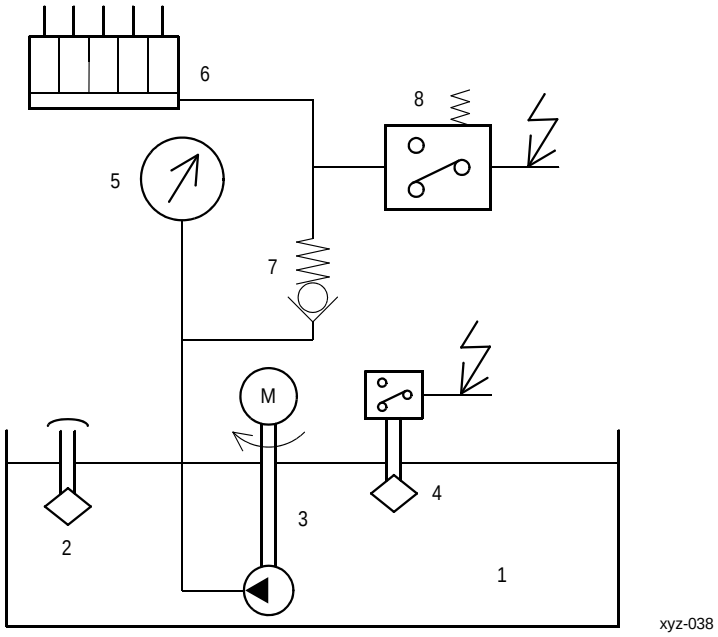


Figure 33 Fluid power diagram

Number	Item	Number	Item
1	Oil tank	5	Pressure gauge
2	Inlet filter	6	Metered distribution
3	Gear pump	7	Non - return valve
4	Oil level switch	8	Pressure switch

3.4 Control Specifications

- Shopmill - easy to convert part drawings into part program software.
- Fast editing of large programs
- Simple, graphically supported setup
- Extensive tool management
- 10.4 in. LCD screen

3.4.1 System Configuration

- Operator control components
- SINUMERIK 810D integrated in SIMODRIVE packaging
- Compact 32-bit microprocessor CNC continuous-path control
  - SIMATIC S7 CPU
  - Up to 6 digital SIMODRIVE 611 drive controls
  - 2 or 3 SIMODRIVE power sections
- Add SIMODRIVE 611 power supply modules and power modules, if required, for a complete system
- 1FK6, 1FT6, 1PH, 1FN, 1FE, and 1FW motors
- SINUMERIK 64E/32A simple I/O module
- SIMATIC S7 I/O modules in S7-300 design and PROFIBUS I/O

3.4.2 Control Design

The control is packaged in a 150 mm wide SIMODRIVE 611 housing and consists of two components: the CCU module (Compact Control Unit) and the CCU power section box. The control system has a range of intelligent, external operator panels for a wide variety of operator requirements. The SINUMERIK HT6 extends the area of application of the operator elements for handling.

3.4.3 Functionality

- Compact digital overall solution using integrated SIMODRIVE 611 power sections, digital drive control, SIMATIC S7 PLC, and SIMODRIVE 611D modules
- Feed and rapid traverse: 0.001 mm/min to 20,000 mm/min
- 2D+2 helical interpolation
- Spindle package with comprehensive functionality, including various thread-cutting functions, variable pulse evaluation, oriented spindle stop
- Smoothed acceleration
- Coupled axes motion
- Programmable acceleration
- NURBS universal interpolator
- Spline interpolation
- Polynomial interpolation up to the 5th degree

- Master value coupling and cam interpolation
- Involute interpolation
- Axis and spindle movements from synchronous actions
- Operating mode independent actions (ASUPS)
- Evaluation of internal drive variables
- Coordinate transformation and inclined machining with FRAME
- Cartesian PTP travel
- Direct/indirect measurement system switchover for high precision and high-speed positioning
- Comprehensive motion control for highspeed machining with look-ahead function and dynamic feed-forward control
- Follow-up mode
- Axis/spindle exchange
- Limit switch signals/cam switching
- Time-reciprocal feed

3.4.4 Operating Modes

- AUTOMATIC
- JOG (set-up)
- TEACH-IN (interactive program development with machine)
- MDA (execute manual input block)
- The operating modes are supported by machine functions:
  - PRESET for setting a new coordinate reference point
  - Simultaneous traversing of axes with up to 2 handwheels
  - Overstore of machine functions in set-up and AUTOMATIC mode
  - Program selection via directory
  - Automatic teach-in via handheld terminal
- SINUMERIK HT6

3.4.5 Contours and Compensations

- Contour violation prediction system
- Configurable number of intermediate blocks for tool radius compensation
- Tool radius compensation with approach and retraction strategies and intersection point calculation
- Interpolatory spindle pitch and measurement system error compensation
- Backlash compensation
- Quadrant error compensation
- Automatic quadrant error compensation

- Electronic counterweight
- Acceleration-dependent feed-forward control
- Temperature compensation
- Multi-dimensional sag compensation

3.4.6 Safety Functions

- Safety routines continuously active for measurement circuits, excess temperature, battery, voltage, memory, limit switches, fan monitoring, EPROM
- Working area limitation
- Two software limit switches
- Contour monitoring
- Spindle monitoring
- Diagnostic functions for interface, PLC, and NC with plain text display on screen

3.4.7 Programming

- Convenient DIN 66025 programming language editor with comprehensive high-level language elements
- Technology cycles for drilling, milling, and turning
- Measuring cycles
- Rigid tapping
- Measurement specification in meters, inches, or mixed
- Comprehensive parameter assignment features
- Program development parallel to machining
- Fast NC-PLC data exchange via dual-port RAM
- Contour and cycle programming
- Reference point approach via program
- Interactive programming on PCU 50/70 with graphical contour generation, technology memory, user-configured displays
- Simulation for turning and milling on PCU 50/70
- Simple ShopMill operating and programming software for 21/2 D machining on vertical and universal milling machines with simulation and contour processing
- SinuTrain (Optional)
- On-line ISO dialect interpreter
- Dynamic FIFO preprocessing buffer
- Configurable number of zero offsets (Optional)
- NC user memory (RAM) up to 2.5 MB for part programs, tool compensations, offsets

3.4.8 PLC

- Integrated SIMATIC S7-compatible CPU
- Program and data memory expandible up to 288/480 Kilobytes
- STEP 7 programming language
- I/O peripherals expandible up to 768 digital I/Os
- I/O peripherals with PROFIBUS-DP expandible up to 2048 digital I/Os
- Position or stepper motor for PLC positioning axis
- HiGraph programming
- Up to 4096 flags, 64/256 counters, 128/256 timers, 256 FBs/FCs, and 399 DBs

3.4.9 Operator Control Components

The operator panels are modular in structure and can be combined for specific performance requirements.

- OP 010S operator panel (310 mm wide), 10.4 in. TFT display, VGA, mechanical keys
- OP 032S full CNC keyboard (310 mm wide)
- OP 010 operator panel, 10.4 in. STN color display, membrane keyboard
- OP 010C operator panel, 10.4 in. TFT color display, mechanical keys
- OP 012 operator panel, 12.1 in. TFT color display, membrane keyboard, and integral mouse, vertical soft keys can be used as direct keys in the PLC
- OP 015 operator panel, 15 in. TFT color display, membrane keyboard, TP 012 operator panel (400 mm wide)
- Machine control panel with 30 unlabelled customer keys and key switch
- MPI interface module for customer machine control panel
- Full CNC keyboard
- MFII standard PC keyboard
- OP 030 slimline operator panel (280 mm wide)
- Handheld unit
- HT6 handheld control unit and programmer
- PCU 20
    - COM 1 (V.24/TTY), COM 2 (V.24)
    - PS/2 mouse, PS/2 keyboard
    - Multi-point interface (MPI)
    - USB, 2 channels (1 x internal/1 x external)
    - Ethernet 10/100 Mbit/s (optional)
    - Cardbus (max. Type III)
    - Disk drive interface (optional)

- PCU 50
  - Removable hard disk with transportation lock (1 Gbyte for user data)
  - MS Windows NT 4.0 operating system (US)
  - COM 1 (V.24/TTY), COM 2 (V.24)
  - LPT1 parallel interface
  - PS/2 mouse, PS/2 keyboard
  - Multi-point interface (MPI)
  - USB, 2 channels (1 x internal/1 x external)
  - Ethernet 10/100 Mbit/s (optional)
  - Cardbus (max. Type III)
  - Disk drive interface
  - Expansion slots: 1 x PCI/ISA + 1 x PCI
- PCU 70
  - Expansion slots: 1 x PCI/ISA + 3 x PCI (otherwise PCU 70 is identical to PCU 50)

3.4.10 Displays

- Screen texts in several languages, switchover function between any two (English, German, Spanish, French, Italian). Other languages available on request
- Program window for block display
- Actual position value in 2 to 5 fold character size
- Screen saver
- Plain text display of operational states

3.4.11 Operation

- Transparent operation: operating areas with both horizontal and vertical softkeys
- Operator panel disable
- User-oriented, hierarchical access protection
- OEM-definable user interface configurable under Windows
- Complete user interface (user-specific)

3.4.12 Communication

- Universal RS232C (V.24)/TTY interface, configuration via plaintext screen
- Reading in/out via universal interface parallel to operation
- Comprehensive archiving
- Data communication with PCIN
- Calculation of tool requirements via SINTDI
- Communication to host via SINCOM
- Data exchange between production planning and production via WINBDE

- Program coordination through CNC high-level language
- Multi-point interface (MPI)
- Second serial interface (HMI via external PC)
- Data exchange between channels I/O interface via PROFIBUS-DP (CCU as master or slave)

3.4.13 Symbols and Abbreviations

AC - Alternating Current

CCU - Compact Control Unit

CNC - Computer Numerical Control

CPU - Central Processing Unit

FIFO - First In First Out

HMI - Human-Machine Interface

I/O - Input/Output

LCD - Liquid Crystal Display

MPI - Multi-point Interface

NC - Numerical Control

PCI - Peripheral Component Interconnect

PCU - Personal Computer Unit

PLC - Programmable Logic Control

OA - Open Architecture

RAM - Random Access Memory

4.0 Shipping and Handling

Lifting, shipping and positioning of machine tools requires specialized knowledge and should only be attempted by experienced operators.

During transportation, the Machine body and coolant tank are stored separately. The shipping and handling equipment used must be capable of lifting the gross weight of the Machine (See Chart). Due to the construction of these Machines, the Machine must be lifted with a crane. Only use the lifting frame supplied by XYZ Machine Tools. Please read the following section carefully before handling the Machine.

4.1 Equipment

Make sure the lifting and handling equipment used is certified to a minimum of a load capacity of 5 tons.

WARNING - Do not lift the Machine with lifting equipment that does not conform to the load capacity. This can result in personal injury and damage to the Machine and equipment.

Use only the specially designed lifting frame provided. Use of slings or other lifting frames are prohibited as they may damage the Machine and result in personal injury. Ensure wire ropes and shackles are certified for the Machine, refer to Section 4.3.

Only use the specially designed lifting frame provided by XYZ Machine Tools to lift the Machine. Use of any slings or other lifting frames are prohibited as they could result in serious personal injury and also damage to the Machine and equipment. Make sure wire ropes and shackles are certified for the Machine, refer to Section 4.3.

4.2 Safety Precautions

1. When lifted, make sure the Machine is balanced before moving it.
2. Do not make sudden changes to the lifting and lowering speed as this can cause instability. This could also result in serious personal injury and damage to the machinery packaging.
3. Do not go under the lifted package.
4. Make sure no personnel are in the work area when lifting the package.
5. Make sure the lifting area is not blocked and all personnel are told to leave the lifting area before proceeding.
6. Do not stop the lifting motion suddenly. Rapid changes in direction could unbalance the load and cause a serious accident and personal injury.
7. Do not hold on to the sling frame or wire ropes.
8. To prevent accidents, only approved personnel are permitted to operate the lifting equipment when handling this machinery package.

4.3 Machine weights and packing crate dimensions

Machine	With Pallet			Package Weight
	Width (cm)	Depth (cm)	Height (cm)	Kg
Mini Mill 560	200	230	244	3,100
Vertical Machining Center 710	230	230	250	3,800

4.4 Lifting the Machine in it's packing crate

4.4.1 Safety Precautions for Lifting the Machine

The following safety precautions must be obeyed when lifting or moving the Machine.

1. Use a forklift of sufficient capacity to raise or move the Machine.
2. When lifting the Machine, make sure it is correctly balanced.
3. When lifting the Machine, use a second person to give lifting instructions.
4. Make sure the forks of the forklift protrude the edge of the Machine bottom.
5. Do not raise the Machine too high as this can cause instability.
6. The forklift must be operated by qualified personnel.

4.4.2 Lifting the Machine with a Forklift Truck

1. The loading capacity of the lifting equipment must be a minimum as specified in Section 4.3.
2. Please refer to Section 4.3 for packing crate dimensions.
3. Make sure the forklift truck is of sufficient capacity to avoid overturning because of the abnormal height. Always keep the load as close as possible to the ground.
4. Use a second person to give lifting instructions.

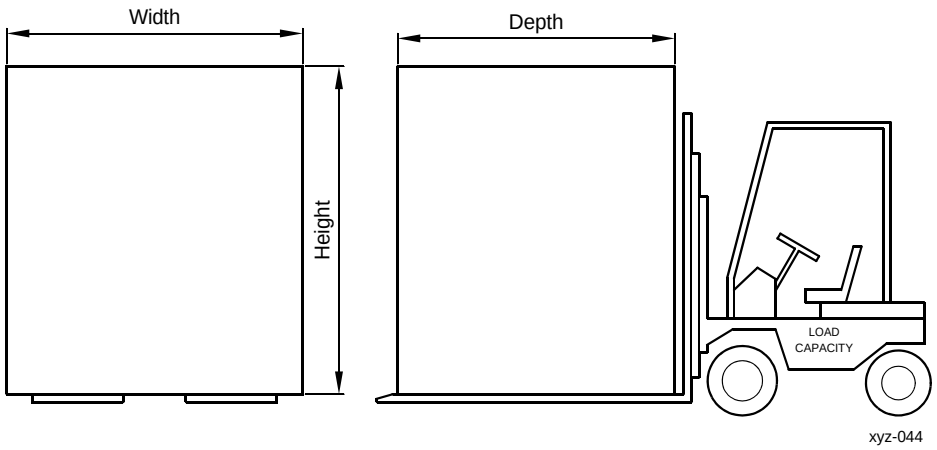


Figure 34 Lifting the Machine with a forklift truck

4.4.3 Lifting the Machine with a Sling Crane or Other Lifting Equipment

Caution - Crane lifting and sling must only be attempted by trained and experienced personnel.

1. The loading capacity of the lifting equipment must be sufficient for the Machine, refer to Section 4.3.
2. Please refer to Section 4.3 for packing crate dimensions.
3. Make sure no personnel are in the work area.
4. When lifting the Machine, make sure it is correctly balanced.
5. Do not lift the Machine too high as the Machine could overturn and cause serious injury and/or damage to the Machine.
6. Use a second person to give lifting instructions.

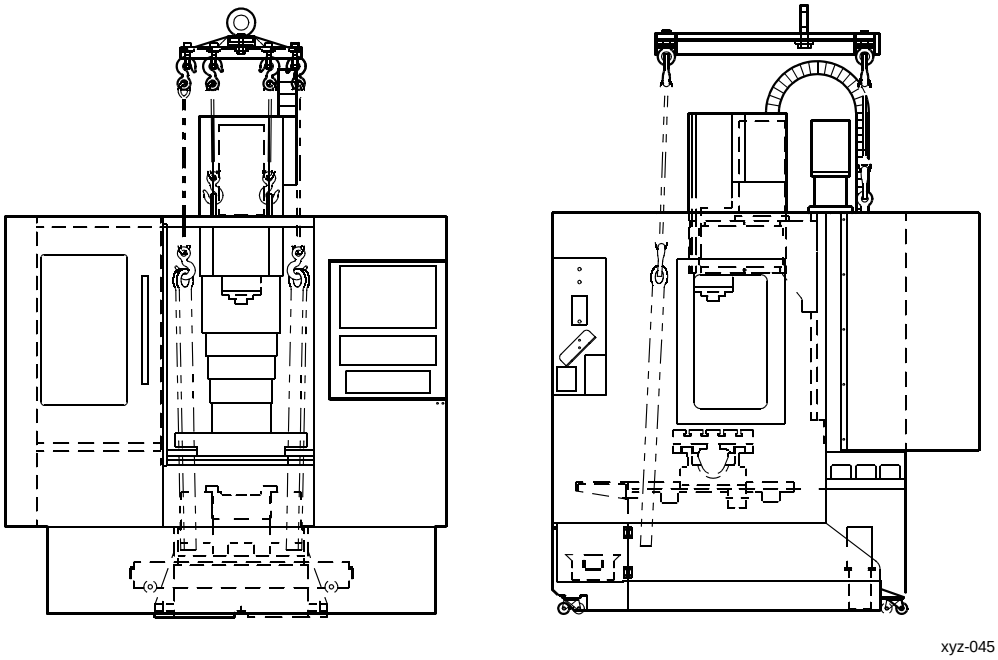


Figure 35 Lifting the Machine with a sling frame

4.5 Securing the Machine during transportation

4.5.1 Head

Position the working table to the middle and move the saddle as close as possible to the main column. Put the head stand provided on top of the working table and bolt the head stand in position. Lower the headstock slowly until it rests on the head stand.

4.5.2 Tool Magazine (560 Mini Mill Only)

The carousel is supplied with a fixing bracket which should be secured before transporting the machine.

4.5.3 Operation Panel

To support the operation panel, install the transit plate under the operation panel pivot.

4.5.4 Power Cabinet

To support the power cabinet, put sufficient wooden blocks under it.

4.5.5 Miscellaneous

Secure all loose parts inside the crate.

4.6 Remove transit fixtures from the Machine

Before operating the Machine, take care to remove all fixtures including the following:

1. Raise the head and remove the head stand from under the head.
2. Remove the fixture which secures the working table.
3. Remove the transit plate from the operation panel.
4. Remove the fixture from the sliding doors.
5. Remove ATC bracket.

4.7 Storage

4.7.1 Storing the Machine with packaging

1. Secure loose parts.
2. Apply anti-rust treatment to the Machine.
3. Secure the Machine inside the storage crate to prevent the Machine from moving.
4. Protect the Machine with a waterproof cover to prevent damage to the mechanical and electrical parts and to withstand moisture and corrosive substances.
5. Apply anti-moisture substance to the inside of the storage crate.
6. Do not put the storage crate directly under sunlight or near any heat source.
7. Do not put the storage crate near corrosive substance or equipment which causes unusual vibration.
8. The Machine must be stored at ambient temperature.

4.7.2 Storing the Machine without packaging

1. Secure loose parts.
2. Apply anti-rust treatment to the Machine.
3. Secure the sliding guards and doors.
4. Protect the Machine with a waterproof cover to prevent damage to the mechanical and electrical parts and to withstand moisture and corrosive substances.
5. Apply anti-moisture substance to the inside of the electrical cabinet, operating panel and to all enclosures.
6. Do not put the Machine directly under sunlight or near any heat source.
7. Do not put the Machine near corrosive substance or equipment which causes unusual vibration.

8. Isolate the power supply and remove the main power supply cables.

5.0 Installation

5.1 Preparation

Ensure the site space and the path width is large enough to transport and install the whole machine before its arrival. If there are access problems or the recommended floor space is not available, please contact your agent or XYZ Machine Tools for advice as early as possible to avoid the possibility of costly siting charges.

Please clear the space in advance for the machine to be moved in and for installation (optional).

Note - Please remember to reserve space for optional equipment.

5.1.1 Space Requirements

A distance of at least 500 mm is required from the Machine to any wall (or other object) and between machines. This allows easy repair, cleaning and maintenance of the Machine. Refer to Figure 36 for recommended space requirements.

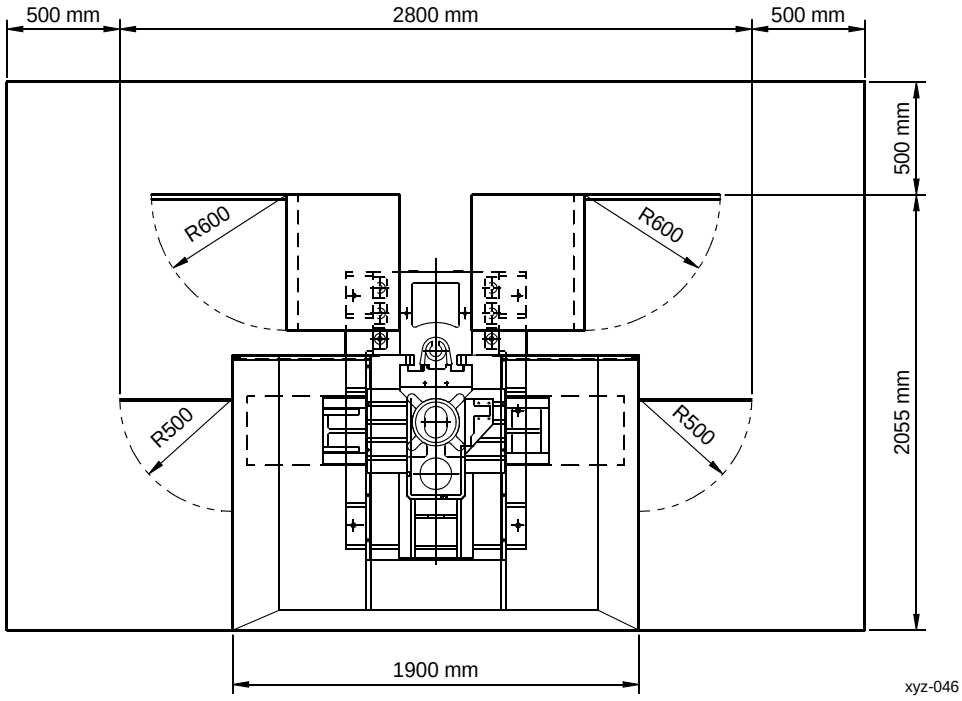
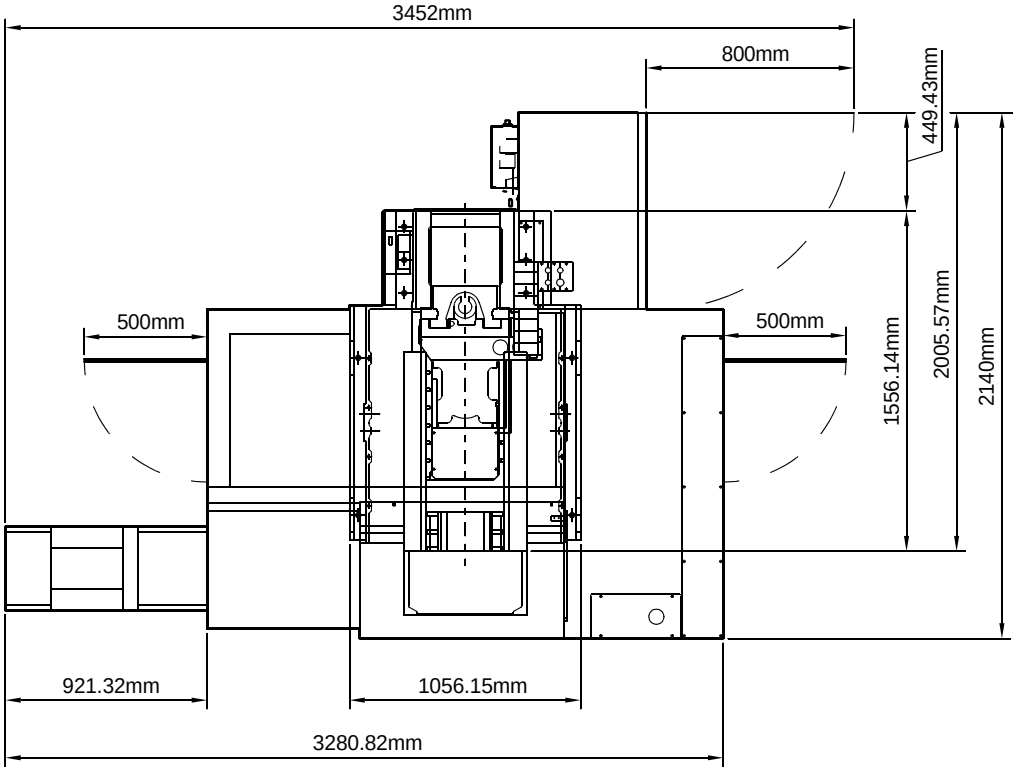


Figure 36 560 Mini Mill recommended space requirements



xyz-188

Figure 37 710 Vertical Machining Center recommended space requirements

5.2 Installation Location

Caution - Do not install the Machine near any vibration sources, for example air compressors, punch press etc. Vibration sources will cause machining inaccuracies.

Caution - Do not expose the Machine and its NC controller to direct sunlight, moisture or corrosion substances etc.

The Machine must be installed on a correctly prepared installation site. This will ensure the Machine will operate efficiently and accurately.

The Machine should be installed in a damp, chemical, dust and shock free environment with an ambient temperature of about 20 °C (68 °F).

5.2.1 Environmental Requirements

The environmental requirements for the Machine are:

- Voltage: 85% to 110% of rated voltage.
- Frequency: Rated frequency ± 2 Hz.
- Temperature: 0 °C to 45 °C (32 °F to 113 °F).
- Relative humidity - less than 90%.
- Do not install the Machine in a dusty or corrosive environment.
- Do not install the Machine in direct sunlight, near a heat source, or where there are large environmental temperature changes.
- Do not install the Machine near any abnormal vibrations.
- Do not install the Machine near magnetic or static electricity fields.
- Do not install the Machine near air compressors or presses.
- Do not install the Machine near any equipment that produces electronic noise.

5.3 Foundation and Construction Plan

The Machine must be installed on a solid foundation to maintain machining accuracy during long operations.

5.3.1 Foundation Construction

The foundation construction work must be completed at least 12 days prior to the installation of the Machine. Refer to Figure 38 for details.

1. Dig the site foundations to 1000 mm depth.
2. Pave the site bottom with a 200 mm layer of pebble stone.
3. Make sure 6 spaces are reserved for the installation of the L shaped fixing studs and foundation pads before filling with concrete. Make sure the 6 surfaces are level and flat.
4. After the concrete has set and is dry and solid, put temporary foundation pads on the 6 reserved spaces. Position the Machine over the foundation pads. Make sure there is a space of 50 mm between the machine base bed and the ground to install the L shape fixing stud.

5. Put the foundation pads on the reserved spaces. Insert the L shape fixing stud through the foundation pad and the foundation bolt and fasten the fixing stud with the nut, refer to Figure 38.
6. Adjust the L shaped fixing studs based on the dimensions shown in Figure 38. Fill the reserved spaces with concrete.
7. Level the Machine after the concrete has set and is dry and solid.

5.3.2 Foundation Construction Plan Two

1. Make sure the ground is solid enough to install the Machine.
2. Position the levelling blocks.
3. Install the Machine on the levelling blocks.
4. Level the Machine as necessary, refer to Figure 38.

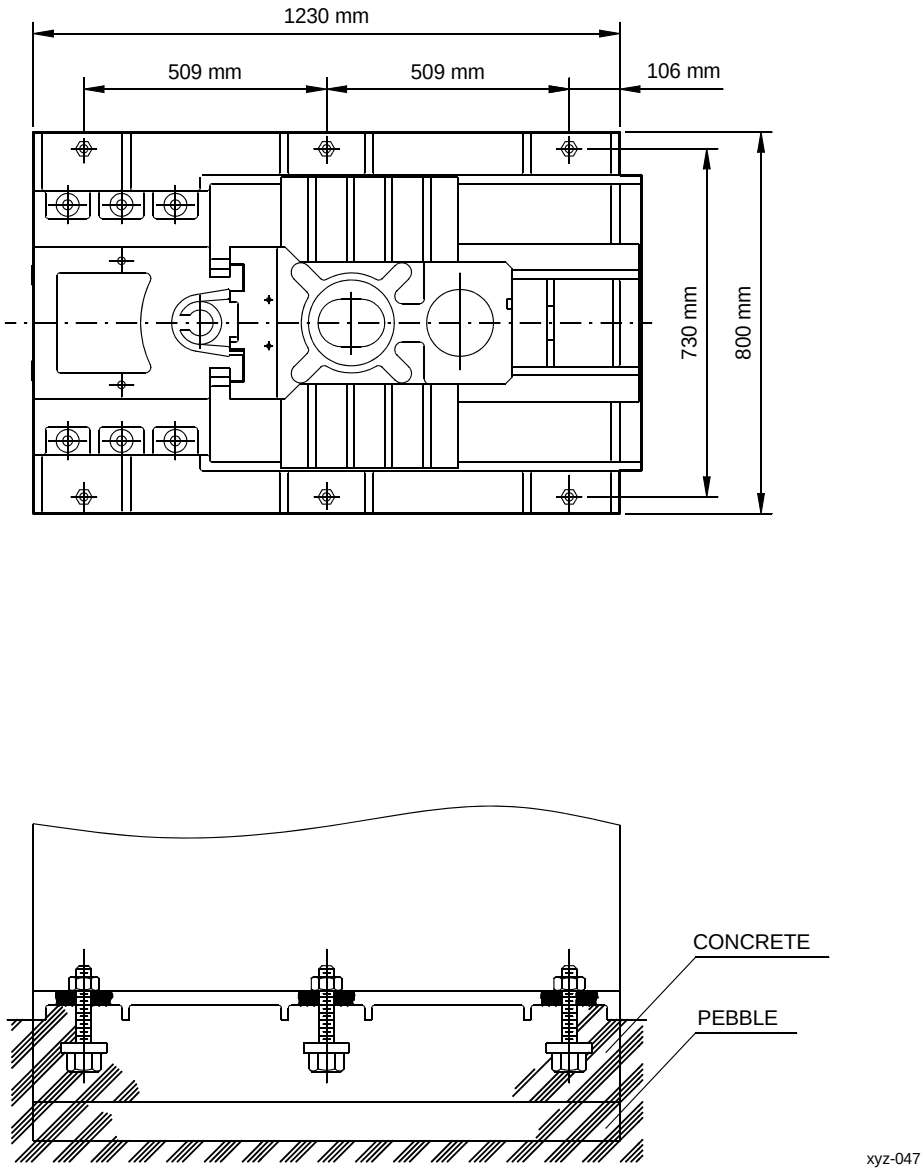


Figure 38 Foundation construction plan

5.4 Levelling the Machine Vertical Machining Center

5.4.1 Adjusting the Machine

1. Position the temporary foundation pads or levelling blocks on the foundation.
2. Insert the L-shape fixing stud through the pad and foundation bolt.
3. Attach the fixing stud with the nut.
4. Adjust the foundation bolts until the space between the base bed and foundation pad is 5 mm.
5. Place two horizontal levels at right angles on the working table. Level the machine until the differences between the levels in both directions are within 0.05 mm/m.
6. Attach the setup nuts for the foundation pads and L shape-fixing studs.
7. Fill the foundation with concrete.
8. Allow the concrete to set for seven days until the concrete is dry and solid.
9. Place two 200 mm long horizontal levels at right angles on the working table. Level the machine until the difference between the levels in both directions are within 0.02 mm/m.

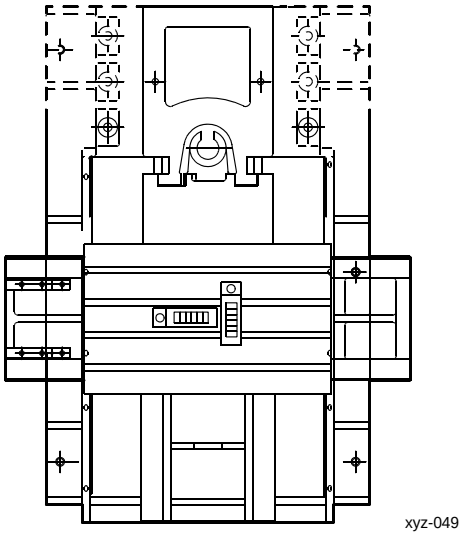


Figure 39 Adjusting the Machine

5.4.2 Adjusting the Square between the Spindle Centreline and the Working Table Surface

1. Set and hold the dial gauge directly under the spindle.
2. Make sure the distance between the dial gauge probe and spindle centerline is 160 mm.
3. Move the headstock along the Z direction until the dial gauge probe touches the working table surface.
4. Rotate the spindle and measure the value.
5. If any value is over the standard value, adjust the Machine.

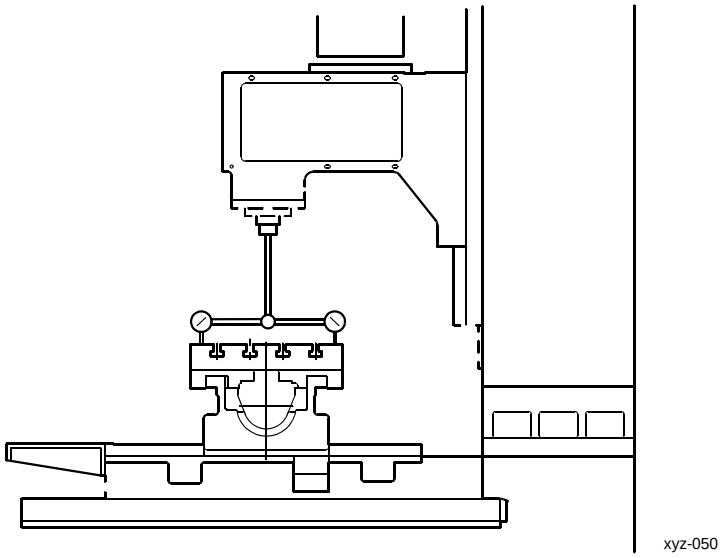


Figure 40 Adjusting the square between the spindle centreline and the working table

5.4.3 Adjust the Square Along the X, Y, Z Axis

1. Prepare the dial gauge set and square rule.
2. Position the square rule on the working table.
3. Fix the dial gauge set directly under the spindle, refer to Figure 41.
4. Move in the X, Y and Z direction to level the machine until the readings at both ends are the same.
5. Measure the square along the three axes.
6. If the values are over the standard value, adjust the leveling screws.

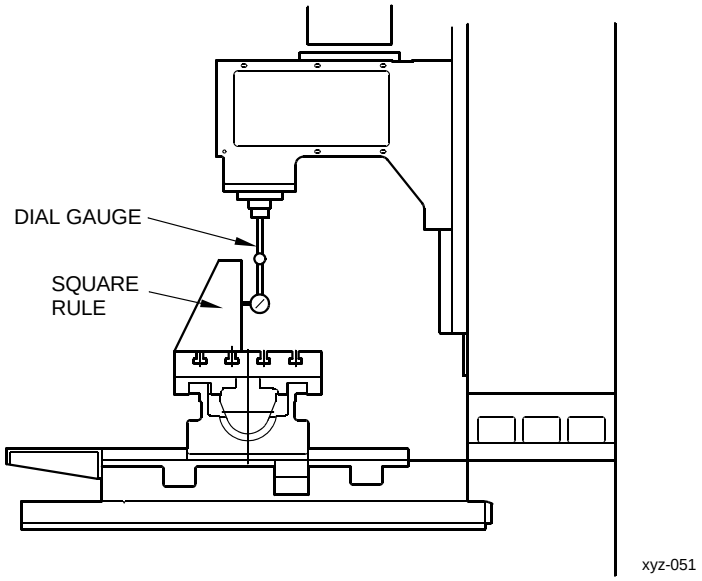


Figure 41 Adjusting the square along the X, Y, Z axis

5.5 Electrical Requirement

For the machine to perform reliably and safely throughout its working life it is essential the following information is followed by a qualified electrician with machine tool experience.

5.5.1 Power Supply

Ensure all wiring including the ground between the consumer unit and the machine comply with local wiring regulations.

WARNING - This work should only be carried out by a qualified electrician.

Take care to install an adequate circuit breaker (see table below) at the consumer unit and the wall isolator.

Thread the power supply cable through the cable inlet positioned at the lower right side of the machine, rest the cable upon the electric cabinet frame, then connect the cable to the mains isolator switch and ground of this machine.

These machines are phase sensitive. After checking the tool carousel and cooling fans and if their direction is wrong, electrically isolate the machine and change over two incoming phases at the machine isolator.

Total power capacity of the equipment: 18 kW						
No.	Voltage	Rated Capacity		Wire	Current-fault breaker	
		560	710		560	710
1	220 V	65 A	75 A	≥ 22 mm²	70 A	80 A
2	380 V	38 A	44 A	≥ 10 mm²	40 A	50 A
3	415 V	35 A	40 A	≥ 10 mm²	40 A	50 A

Rest the cable on the electrical cabinet frame.

Connect the cable to the main power supply switch of the Machine.

5.5.2 Power Wiring

WARNING - Only qualified engineers are allowed to install or maintain the electrical equipment of this machine. Failure to do so may result in serious accident.

1. Ensure the electrical cables have the same or better power rating as prescribed in the electrical document.
2. Only qualified engineers are allowed to connect the power cable to this machine.
3. Do not connect any power cable that might generate signal noises on the power panel of this machine.
4. Do not connect the power cable of this machine to any power source that may be subject to an abrupt voltage drop.
5. Remove all the anti-moisture substances placed inside the cabinets or panels.
6. Always turn off all the power at the wall isolator or consumer unit and place 'Under Installation High Voltage Equipment. Do not turn on the power in front of the consumer unit or wall isolator before connecting the power supply.

5.5.3 Grounding

The grounding conductor should be connected to the ground point in the electrics cabinet, marked PE (or displaying a ground symbol) adjacent to the main isolator. If there is no 'PE' wiring connection on the factory power supply please ask the electrics supply company to provide a certified ground.

1. The minimum cross section area of the grounding wire is 10 mm^2. The grounding wire of this machine should be connected to its own grounding terminal individually. This kind of arrangement could prevent external grounding current into this machine. This current may result in serious damage on this machine and is prohibited.
2. Do not share the grounding terminal of this machine with other equipment, such as welding equipment and high frequency induction machines.
3. Ensure the power rating of the grounding terminal is compatible to the power rating of the machine.

WARNING - Don't turn on the power before the protective grounding has been connected and tested, otherwise this may result in a serious incident.

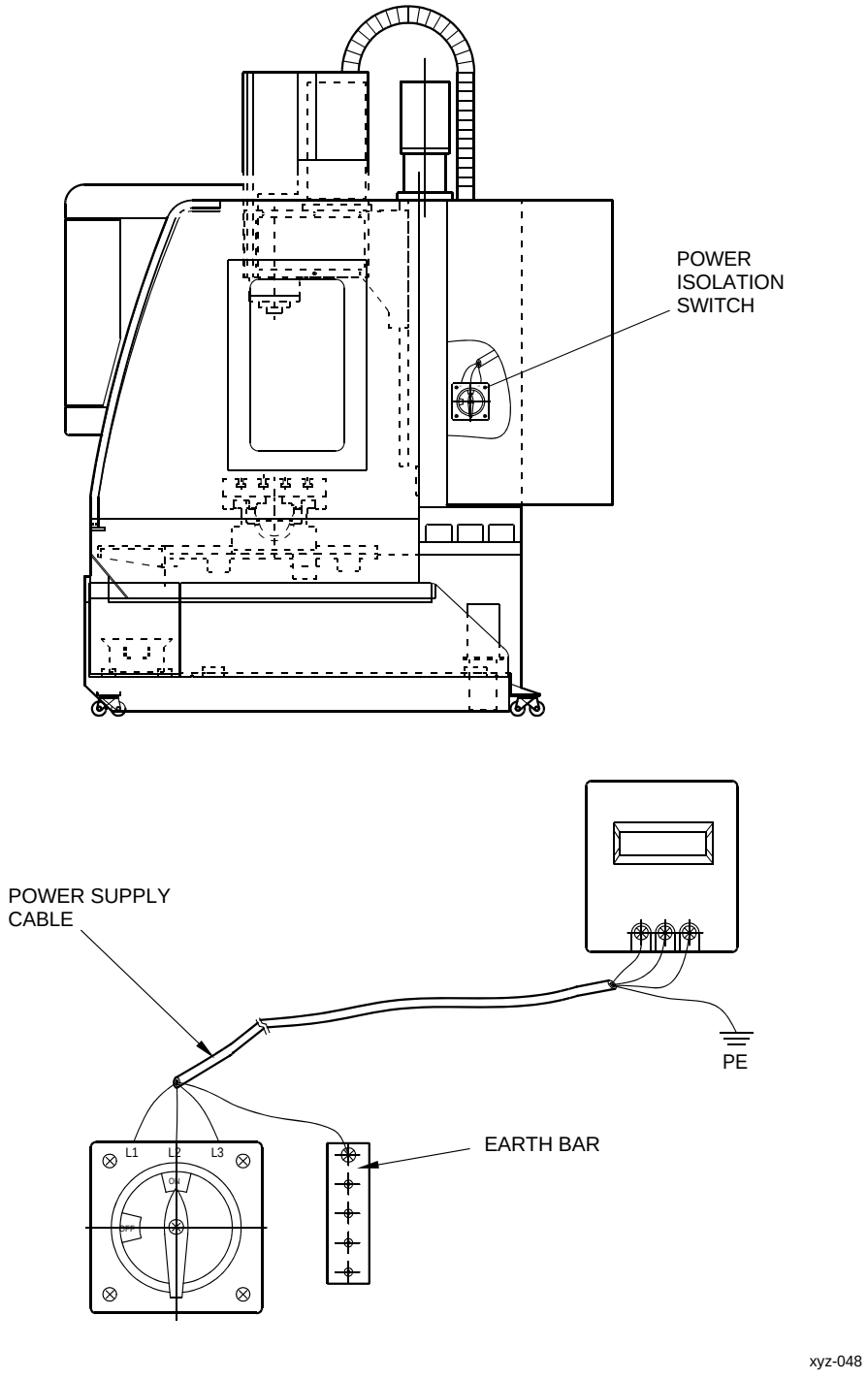


Figure 42 Electrical connection

5.6 Installing the Lubrication System

5.6.1 Installing the Lubricator

Install the lubricator to the machine at the suspension holes with two screws, refer to Figure 43 items 1, 2 and 3. Set the holes distance to 188 - 206 mm on the machine. Install the lubricator at a height of 600 mm - 1700 mm above the ground level.

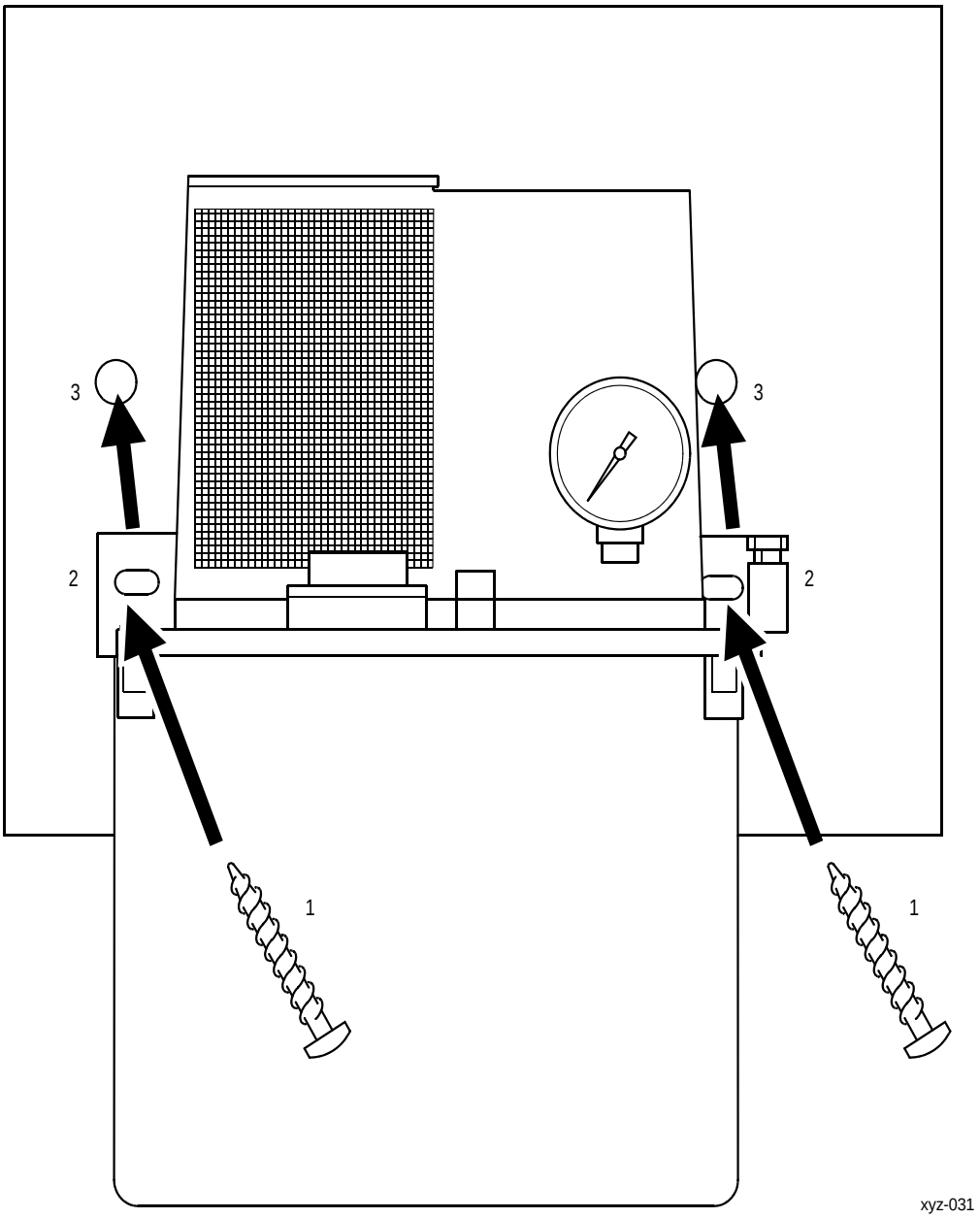


Figure 43 Installing the lubricator

5.6.2 Filling the Centralized Lubrication System

Caution - The lubricator may burn if oil with a viscosity higher than 250 cSt is used.

Note - Only use ISO 32 oil.

Remove the oil tank cap and use clean oil to fill the tank until the oil level reaches the 'HIGH' line, refer to Figure 44. The oil tank has an capacity of 3 litres. After filling the system with oil to the correct level, replace and lock the oil tank filler cap.

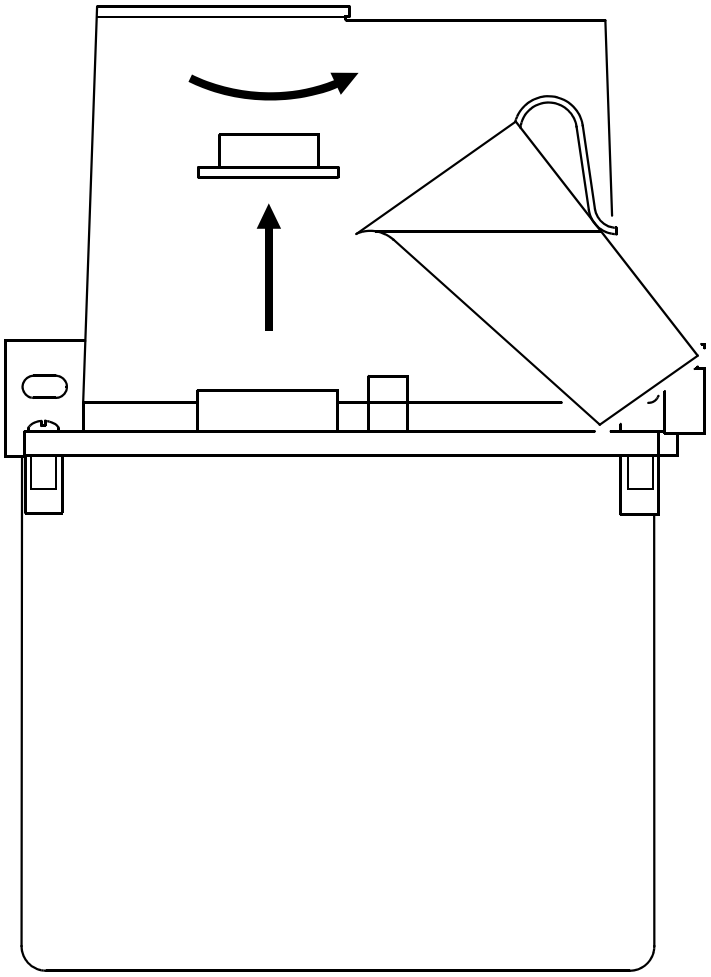


Figure 44 Filling the centralized lubrication system

5.6.3 Connecting the Oil Pipe

To connect the oil pipe:

1. Locate the elbow joint on the right side of the lubricator, refer to Figure 45 item 3.
2. Remove the compression nut, refer to Figure 45 item 1.
3. Carefully remove the olive, refer to Figure 45 item 2.
4. Insert the hose, refer to Figure 45 item 4, through the compression nut (1).
5. Insert the olive (2) into the hose (4).
6. Connect the oil pipe, together with the compression nut and olive, to the elbow joint, refer to Figure 45 item 3.

Note - To avoid oil leakage during operation, the olive (2) should be inserted into the hose (4), so that at least 1 mm of the hose protrudes over the olive before connecting the hose to the elbow joint.

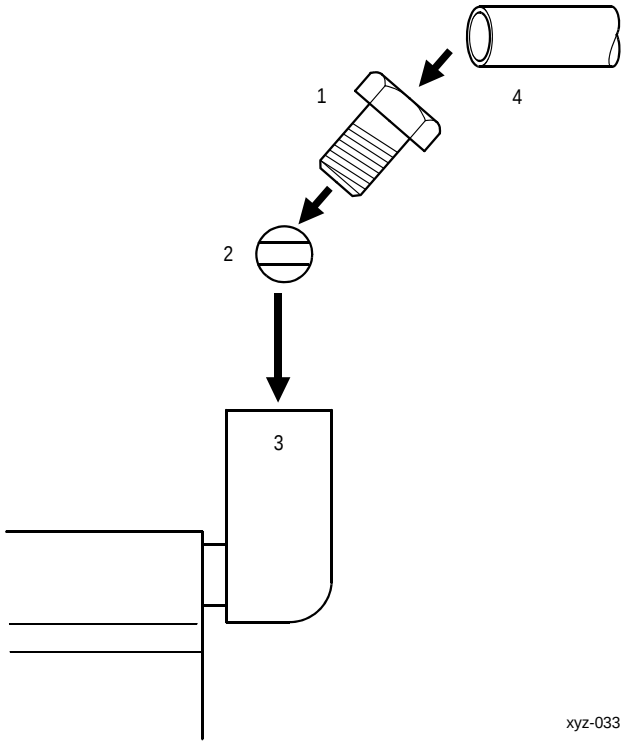


Figure 45 Connection of oil pipe

5.6.4 Installation of Power and Alarm to the Lubrication System

Note - A fuse must be installed between the power supply and the lubricator.

To connect the cable for power and alarm:

1. Remove the screws from the control box casing, refer to Figure 46.
2. Remove the upper cover of the control box.
3. Remove the cable gland that fastens the cable to the left side of the control box, refer to Figure 47.
4. Push the cable through the opening into the casing, refer to Figure 48.
5. Loosen the earthing point screw at position P1 6, refer to Figure 49.
6. Connect the ground cable and tighten the fixing screw.
7. Connect the positive and negative cables for “POWER” at position P1 4 and P1 5, refer to Figure 49.

Note - In this configuration, the motor will start when you operate the restart key.

Note - The YET-C1 / YET - C2 lubricators are designed to lubricate by external control.

8. Connect the external control system or computer to the external ports at position P1 3 and P1 4, refer to Figure 49.

Note - You can also connect the controller to the alarm adaptors at position P1 1 and P1 2, refer to Figure 49. The warning system for YET-C1 is suggested as the oil-level switch and for the YET-C2 model the pressure switch. The Alarm will activate when the oil level is low for the YET-C1 model and when the pressure is low for the YET-C2 model.

9. Connect your alarm system as necessary with the lubricator.
10. Install the cover after having connected all cables.
11. Install the cover screws.
12. Install the cable securing gland to secure the cables.
13. Connect the lubricator to the power supply.

When connected correctly, the lubrication indicating lamp will illuminate and the lubricator will start to lubricate.

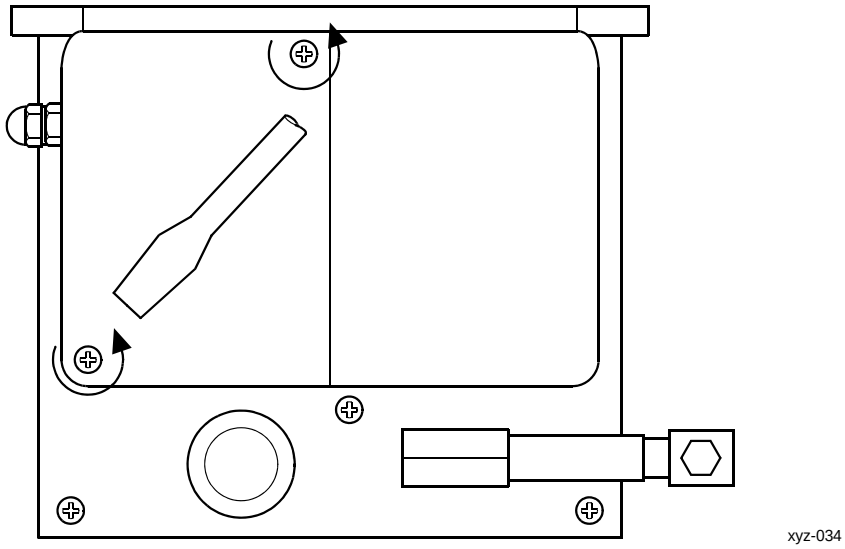


Figure 46 Control box

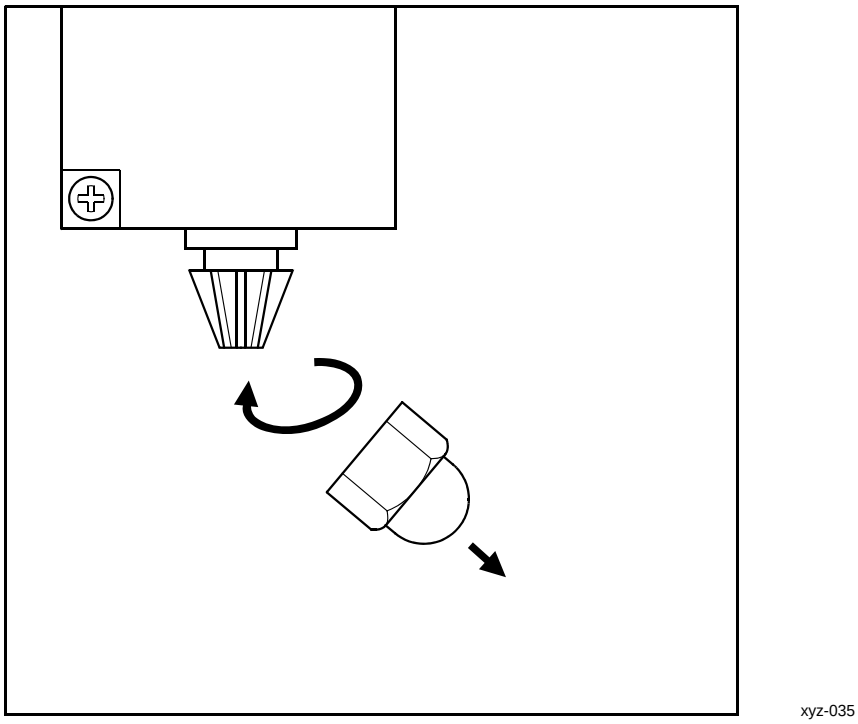


Figure 47 Cable gland

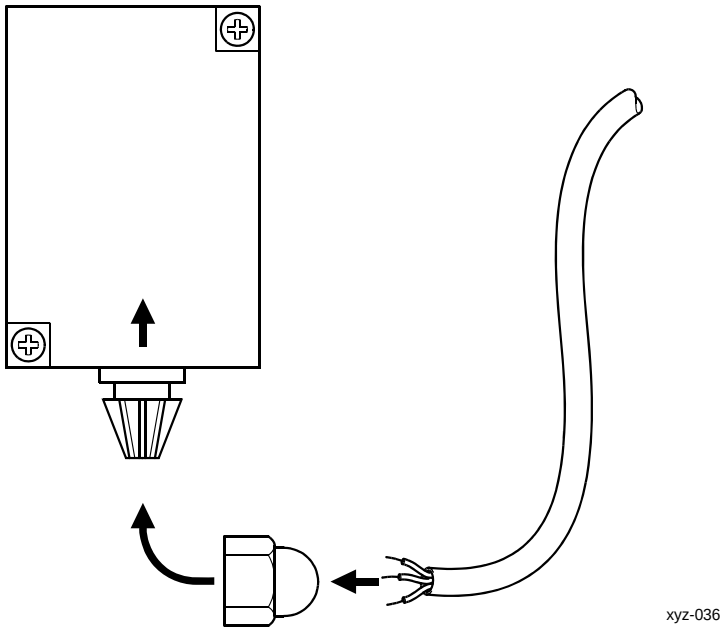


Figure 48 Push cable through casing

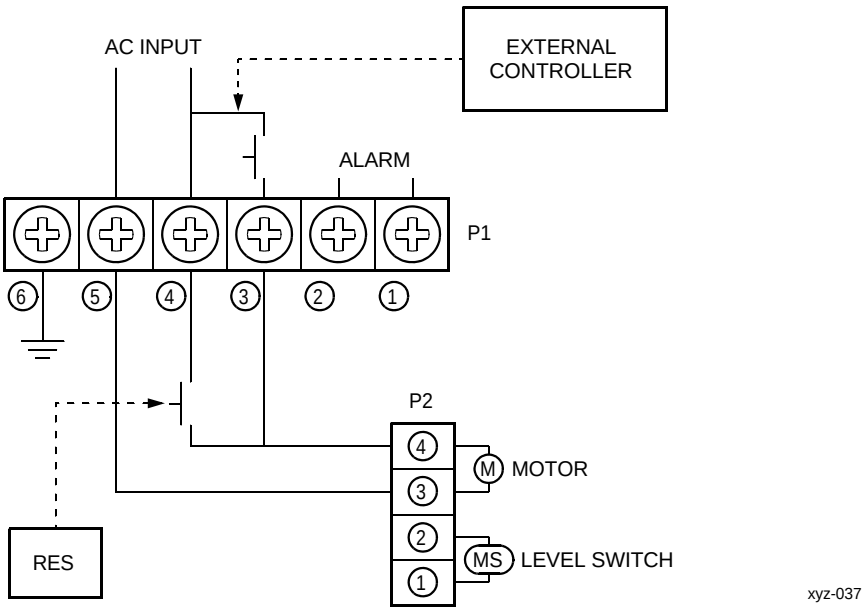


Figure 49 Power and alarm connection points

5.7 Inspection

5.7.1 Before Power Start-up

1. Make sure the power supply specification is correct (check transformer tappings are set for the supply voltage).
2. Make sure electric cables and connections are correct to local safety regulations.
3. Make sure connections between the machine and grounding terminals are correct.
4. Make sure the circuit breaker or fuse required by the local safety regulations is installed and the correct rating on the power supply side.
5. Make sure the temporary fastening equipment used during the transportation process are removed.
6. Make sure there are no loose components on the working table.
7. Make sure there are no loose components on the folding guard.
8. Make sure all the fixing studs are attached correctly.
9. Check all nuts, bolts, locks, and other components are secure.
10. Make sure the hydraulic, pneumatic, and cutting coolant systems are connected correctly.
11. Make sure the safety-guarding shields and doors are in a good working order.
12. Make sure the hydraulic oil, lubricant, and cutting coolant are filled to the required levels.
13. Make sure all the over-travel limit switches are working.
14. Make sure the tension of the spindle driver's belt is correct.
15. Make sure there are no personnel or substance around the Machine before starting.
16. Read the Machine manuals carefully and understand the safety instructions and operating procedures before starting up the machine.

5.7.2 After Power Start-up

WARNING - Lethal Voltages. Use suitably qualified electricians to install and maintain the Machine electrical equipment. Failure to do so may result in a lethal electric shock or serious injury.

Make sure the power supply wiring is connected to the correct connection points. Follow the instructions below to check the power wiring.

1. Make sure the power supply switches operate normally.
2. Make sure the hydraulic pump and cutting coolant pump operate normally. Stop the machine immediately if the pressure indications are not correct. Check the power supply wiring connection if necessary.
3. Make sure the emergency stop switch operates correctly.
4. Make sure the lubrication pump operates and all the machine parts are lubricated properly.
5. Make sure the stroke-limiting functions specified by the NC programming codes and over-travel limit switch work correctly.

6. Run the test program to ensure the Machine operates in a normal condition.
7. Wait a minimum of 30 seconds between power switch off and power on at the mains isolator. This allows the machine self checking circuits to fully reset.

6.0 Basic Operation

The Machine can be operated in manual or automatic mode. Read this section carefully to understand how to operate the MACHINE.

6.1 Machine Safety Equipment

The safety equipment installed on the Machine includes:

- Fully-enclosed splash guard.
- Over-travelling limit switches for moving in the X, Y and Z directions.
- Emergency stop push button.
- NC programming codes which limit the travelling distance.
- Interlock relationships specified by the NC software codes which prevent incorrect operation of the Machine.

6.2 Prior to Start Up

WARNING - Before operating the Machine, make sure the wires and cables are insulated correctly to prevent electric shock and serious injury.

6.2.1 Pre-operation Inspection

1. Make sure there are no loose wires or connections.
2. Make sure the electrical cabinet, NC controller doors and other safety guard doors are closed.
3. Make sure all machine parts are secure.
4. Make sure the Machine oil levels are correct.

6.2.2 Safety Precautions

1. Fully understand how to operate the Machine before use.
2. Wear personal protective equipment when operating the Machine.
3. Make sure the doors, safety guards, operating panel and the main power supply panel are closed before operating the Machine.

6.2.3 Notices

1. Make sure the power supply is sufficient to operate the Machine.
2. All cables must be protected from contact with debris.
3. Before operating the Machine, lubricate the sliding parts sufficiently with the centralized lubrication system.
4. Use the correct lubrication oil, refer to Section 8.3.4.
5. Make sure all switches, push buttons and operating levers operate correctly.
6. Check the oil level of the oil tank regularly. If necessary, fill the oil tank with the correct oil, refer to Section 8.3.4.
7. Check the coolant level of the coolant tank regularly. If necessary, fill the coolant tank with the correct cutting fluid, refer to Section 8.3.4.

8. The Rotary Tool Changer gear speed reduction motor power is 220 V/60 Hz, 200 V/50 Hz.
9. An additional air filter should be installed in the Rotary Tool Changer to remove unwanted substances and water.
10. Regularly grease the contact faces of the Rotary Tool Changer tool pockets.

6.3 Starting and Stopping the Machine

6.3.1 Starting Procedure

1. Connect the power supply.

Caution - Before switching on the power supply, make sure the load capacity is correct.

2. Switch on the main power supply switch.
3. To switch on the main power:
   - Switch on the main power supply.
   - Switch on the isolator. Press reset.
   - Press the servo on button, located on the side of the pendant.
   - To reference the machine, press the cycle start button (ensure feed overrid is on 100%).

Note - Make sure the standby signal light is on after switching on the main power supply.

6.3.2 Emergency Stop Procedure

Push the emergency stop button on the main operation panel to stop the machine immediately. Pull the emergency stop button to release, refer to Figure 52, and then press reset and servo on.

6.3.3 Normal Stop Procedure

1. Stop all machine movements.
2. Push the ‘Stop’ button on the NC equipment, refer to Figure 50.
3. Switch off the main power supply switch.

6.4 Warm Up

Prior to the operation of the Machine, warm up the machine, as the sudden thermal expansion of the casting parts can damage the contact surfaces of the sliding parts.

6.4.1 Notices

1. Warm up the Machine in automatic mode for 10 to 20 minutes by running a program. Make sure the Machine has an appropriate spindle speed and feed rate.
2. Make sure the Machine is operating correctly during the warm up of the machine in automatic mode.

6.5 Preparation

6.5.1 Safety Precautions

1. Use the correct cutting tools.
2. Do not use broken or defective cutting tools.
3. Make sure the work area has adequate lighting.
4. Keep the tools and equipment around the Machine in position.
5. Keep the Machine and the work area clean.
6. Do not put any items on the work surfaces, headstock, working tables, guideways, saddle or safety guards.

6.5.2 Notices

Caution - Before switching on the power supply, make sure the load capacity is correct.

1. Make sure the alarm indicator messages are off before operating the Machine.
2. Check the oil level of the oil tank regularly. If necessary, fill the oil tank with the correct oil, refer to Section 8.3.4.
3. Use the correct cutting tools.
4. Test the Machine with a trial test piece before normal operation.

6.5.3 Alarm messages

1. Refer to alarm message page.

6.6 Operational Safety Precautions

1. Keep long hair and loose clothing away from the rotating parts of the Machine.
2. Do not wear gloves when operating the Machine.
3. Use appropriate manual handling techniques to handle large workpieces.
4. The forklift, crane and lifting equipment must be operated by qualified personnel.
5. Use the correct lifting equipment.
6. Be careful of the surroundings when operating the lifting equipment.
7. Make sure the workpiece is correctly clamped in the holding device before operating the Machine.
8. Stop the Machine before adjusting the coolant nozzles.
9. Do not touch or reach over moving or rotating machine parts.
10. Do not remove any safety equipment.
11. Use the correct tools to remove the debris from the cutting tool.
12. Stop the Machine before installing or removing the cutting tool from the chuck or other tool holding equipment.
13. Wear appropriate personal protective equipment when working in a dusty environment.

14. Wear a safety mask and open the dust collecting equipment when machining a workpiece made from graphite or other materials which create dust.
15. Do not open the safety guard doors when operating the Machine.
16. Monitor the swarf build-up during machining and make sure the build-up does not become excessive.

6.7 Referencing the Machine

1. Stop all machine movements.
2. Push the 'Stop' button on the NC equipment, refer to Figure 50.
3. Switch off the main power supply switch.

6.8 Manual Operation Procedure

6.8.1 Manual Operation Mode

Set the mode select switch to JOG mode to enable manual operation mode, refer to Figure 52.

Note - Setting the mode select switch to manual mode will interrupt the automatic operation process. The manual operation will stop if any mode other than manual mode has been selected.

6.8.2 Manual Feed Motion

1. Set the mode select switch to JOG mode to enable the manual feed motion, refer to Figure 52.
2. Adjust the feedrate, refer to Figure 53.
3. Select the axis to feed (X, Y or Z).
4. Push the + or - button to start the feed motion. With the button pushed, the feed motion will continue and when the button is released the feed motion will stop, refer to Figure 53.

6.8.3 Manual Rapid Traverse Feed

1. Set the mode select switch to JOG mode to enable the manual rapid traverse feed, refer to Figure 52.
2. Push the rapid traverse speed button and select the feed direction to start the manual rapid traverse feed. The feed movement will stop when the rapid traverse speed button is released, refer to Figure 53.

6.8.4 MPG Feed Motion

1. Set the mode select switch to JOG mode, refer to Figure 52.
2. Use the MPG scale select to set the correct speed and select the motion direction, refer to Figure 52.
3. Use the hand wheel to control the feed motion. Press dead mans button on back of hand wheel.

6.9 Starting and Stopping the Spindle Rotation

To start and stop the spindle rotation:

1. Set the mode select switch to JOG mode, refer to Figure 52.
2. Push the spindle clockwise or anticlockwise switch to rotate the spindle, refer to Figure 52.
3. Adjust the spindle override switch to select the correct spindle speed, refer to Figure 53.
4. Push the spindle stop button to stop the spindle rotation, refer to Figure 53.
5. The spindle motion can also start and stop in MDI mode by using the M functions, for example:
    - Spindle rotation speed - Sxxxx
    - Spindle clockwise rotation start - M03
    - Spindle anticlockwise rotation start - M04
    - Spindle stop - M05

6.10 Automatic Tool Change (ATC) Procedure

6.10.1 Tool Mounting

The regulations for tool mounting are:

1. The maximum tool weight is 8 kg.
2. The maximum tool length is 100 mm.

6.10.2 Manual Tool Change

To change the tool in manual mode:

1. Set the mode select switch to JOG mode, refer to Figure 52.
2. Make sure the spindle has stopped.

Caution - Before pushing the tool clamp/unclamp button, hold the tool holder to prevent the tool from falling.

3. Push the tool clamp/unclamp button to release the tool, refer to Figure 53. When the tool clamp/unclamp button is pushed, a stream of air flows from the spindle hole to clean the tool holder.

Note - Prior to clamping the tool, clean the tool and the tapered portion of the tool holder.

4. Align the tool holder with the drive key on the spindle and insert the tool in the spindle taper hole.
5. Hold the tool and push the tool clamp/unclamp button to clamp the tool. Make sure the tool holder is clamped correctly.

6.10.3 Tool Change in MDI Mode

1. Select JOG on control.
2. Press Menu Select.
3. Press Machine.

4. Select TSM.
5. Highlight ‘Tool’ and press the ‘Tool’ soft key.
6. A menu with possible tools is shown on the screen.
7. Highlight the required tool and press ‘In Manual’ soft key.
8. Push the cycle start button to start the tool change process, refer to Figure 52.

Figure 50 Machine control panel

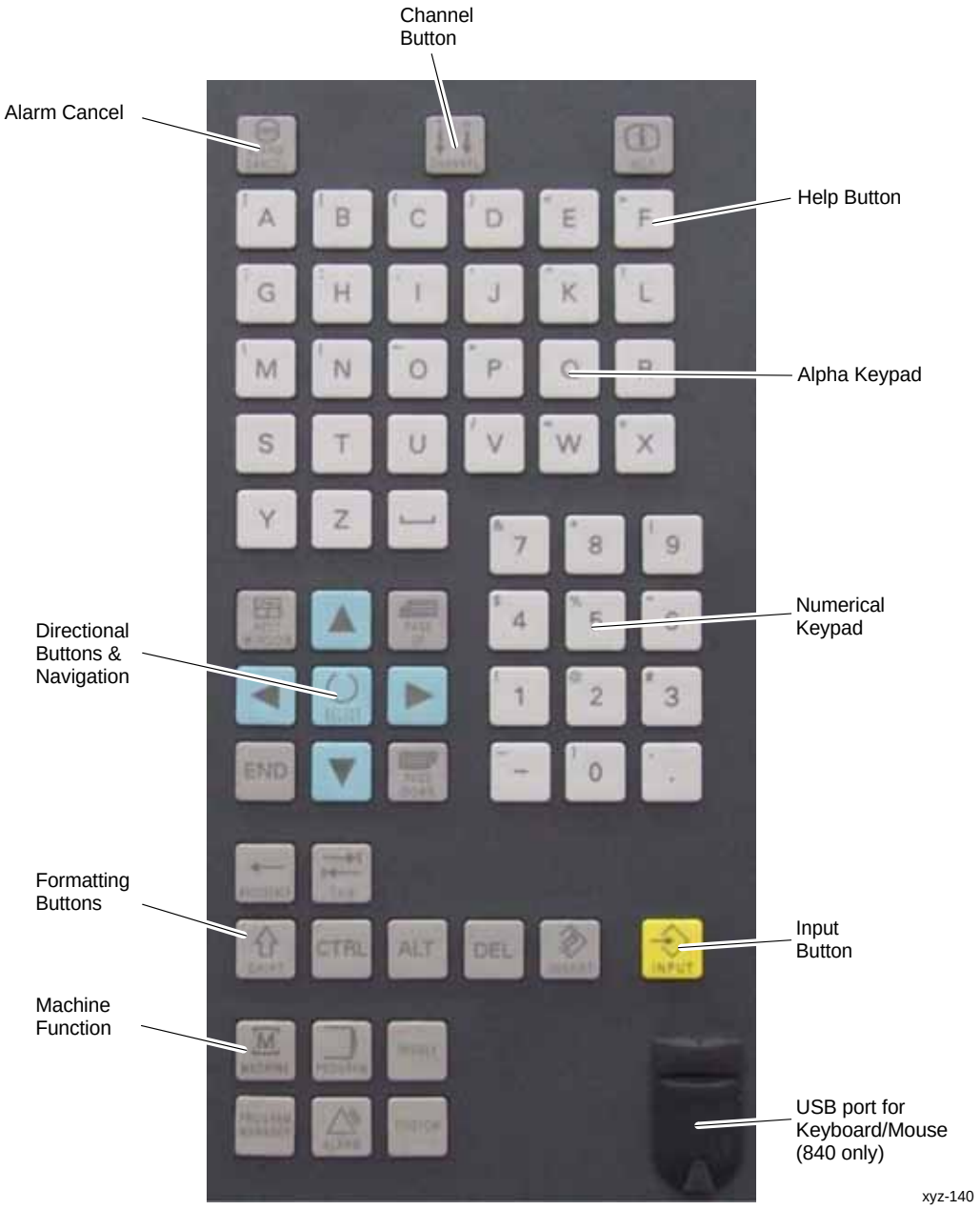


Figure 51 Machine control panel

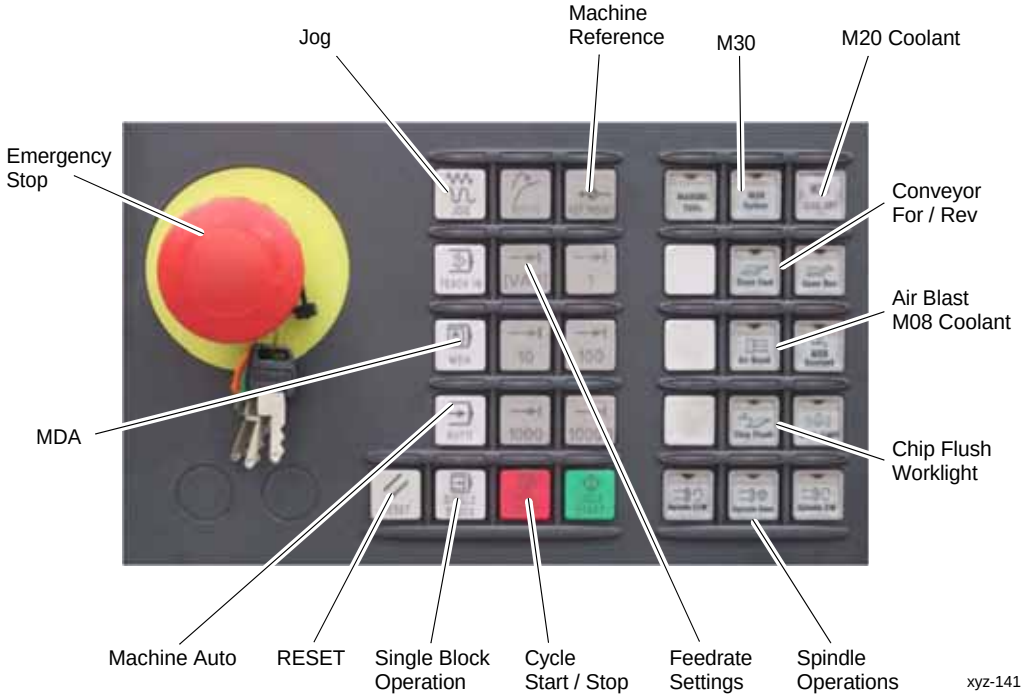


Figure 52 Machine control panel

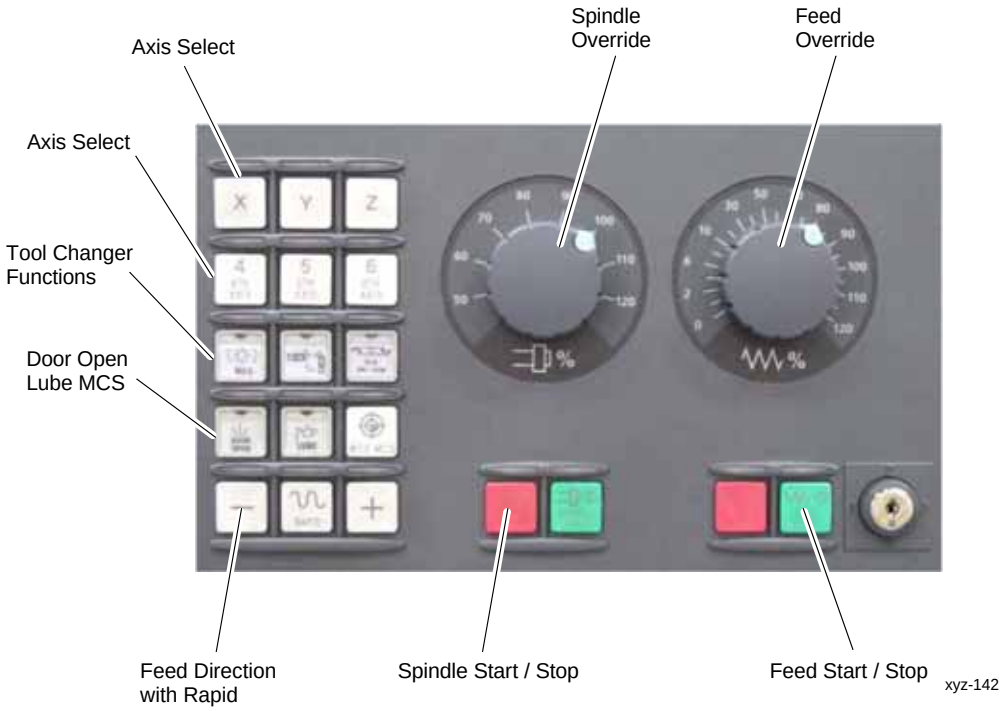


Figure 53 Machine control panel

6.10.4 ATC Edged Tool Change

1. In the tool holding position, turn the edged tool 60° when the shaft is in position, refer to Figure 54.
2. Pull edged tool down.
3. Turn the edged tool 180°.
4. At the start of tool holding, pull the edged tool up.
5. Turn the edged tool 60° to the opposite to finish the edged tool change.

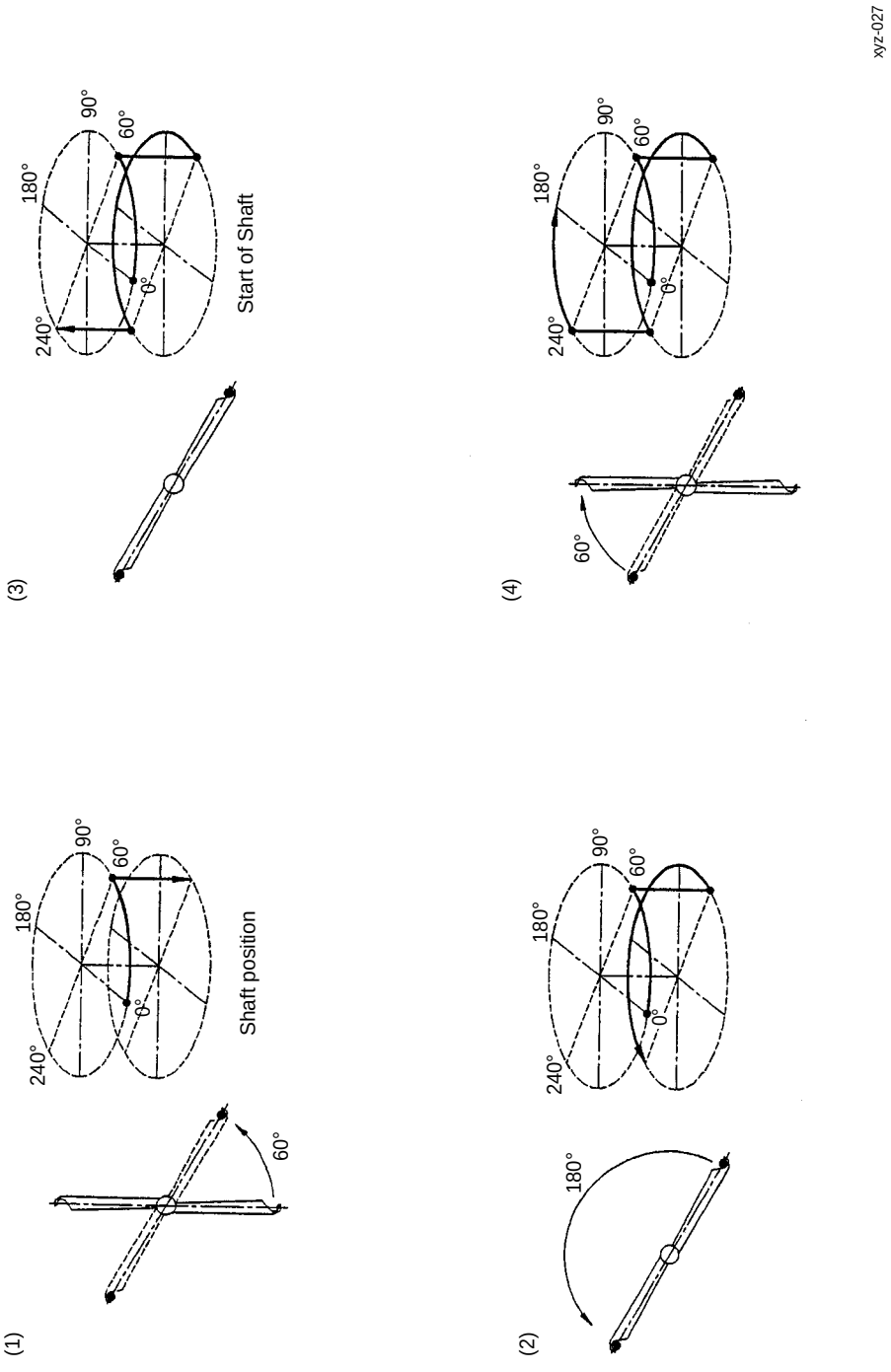


Figure 54 ATC edged tool change

6.11 Automatic Operation

The two types of automatic operation are:

- Auto mode
- MDI mode manual data input

6.11.1 Preparation

To prepare for the automatic operation procedure:

1. Decide on the correct way to machine and mount the jigs and fixture equipment.
2. Plan the machining sequence.
3. Select the correct machine tools and set the tool sequence.
4. Select the correct cutting conditions.

Note - Make sure the cutting conditions meet the specifications of the Machine.

6.11.2 Automatic Operation Procedure

To machine a workpiece in automatic operation mode:

1. Prepare the workpiece drawings, tool sequence schedule and programming codes.
2. Prepare the workpiece, jigs and fixture equipment.
3. Install the tools into the pockets.
4. Identify each machine tool with a tool description and set offsets.
5. Do a test run with no load.
6. Do a cutting test.
7. Measure the workpiece dimensions for further adjustments and modifications.
8. Continue with normal operation.

6.11.3 No Load Test Run Procedure

To test run new programs before machining the workpiece:

1. Remove the workpiece from the jig.
2. Press the Auto switch to select Auto mode.
3. Push the single block operation button to test the programs block by block.
4. Push the cycle start button to start the process. When the commands in one block are tested correctly, push the cycle start button to resume the process. Repeat until all of the new programs are tested.

6.11.4 Automatic Cutting Operation

When the no load test run is complete and correct, start the cutting test:

Note - Reference the Machine after starting the Machine.

1. Set the feed override switch to 100%.
2. Set the spindle override switch to 100%.

Note - The feed and spindle override can be reduced (if required).

3. Press the Auto switch to select Auto mode.
4. Secure the workpiece.
5. Push the cycle start button to start the process.
6. If an emergency occurs, push the feed hold button or the emergency stop button.

6.12 Switching Off Procedure

1. To power down the Machine, press the E-stop on the pendant.
2. Switch off the main power supply switch located on the electrical cabinet wall.
3. Isolate the Machine at the isolator.

6.13 Post-operation Maintenance

1. Make sure all components of the Machine are in good working order.
2. Check the centralized lubrication system and if necessary, fill the oil tank with the correct oil, refer to Section 8.3.4.
3. Make sure no leakage has occurred in the pipelines.
4. Make sure all screws are secure.
5. Make sure all gauges and indication meters are in good working order.
6. Clean the Machine and work area.

6.13.1 Notices

1. Switch off the power supply of the Machine and put ‘Under Maintenance. Do not switch on the power supply’ warning signs in visible locations.
2. Clean the Machine and the work area. Put all items in their correct position.
3. Apply anti-rust oil to the machine bed and all moving parts to protect from rust and dirt.
4. Return the moving parts of the Machine to the original zeroing position.
5. Check the wipers and replace if broken.
6. Check the lubricant and hydraulic oil and replace if dirty or emulsified.
7. Check the coolant and replace if dirty.
8. Check the lubricant, hydraulic oil and coolant and refill if necessary.
9. Clean the filters of the lubrication, hydraulic, and coolant systems.
10. Switch off all power switches and main power circuit breakers.

7.0 Adjustment

WARNING - Risk of serious injury. Make sure the main power supply to the Machine is isolated and warning signs are displayed before inspecting the belt tension. Failure to isolate the main power supply can result in serious injury.

Note - Check the Machine pressure readings regularly to make sure all system pressures are normal.

Note - Check regularly for any abnormal noises from the internal moving parts.

Note - Make sure rotating parts are lubricated correctly.

Note - Make sure all safety guards are installed correctly.

Note - Adjust the belt tension in accordance with the values given in this manual.

7.1 Spindle Transmission Belt Tension

Note - Check the main drive belt tension every 6 months.

To adjust the belt tension:

1. Loosen the four screws (marked 'A', refer to Figure 55) on the motor stand (without gear box) and the nut 'B'.
2. Turn screw 'C' to adjust the belt tension.
3. Tighten the nut 'B' and four fastening screws 'A'.

Caution - Make sure the spindle transmission belt tension is correct. If you can't adjust the belt tension contact XYZ Machine Tools.

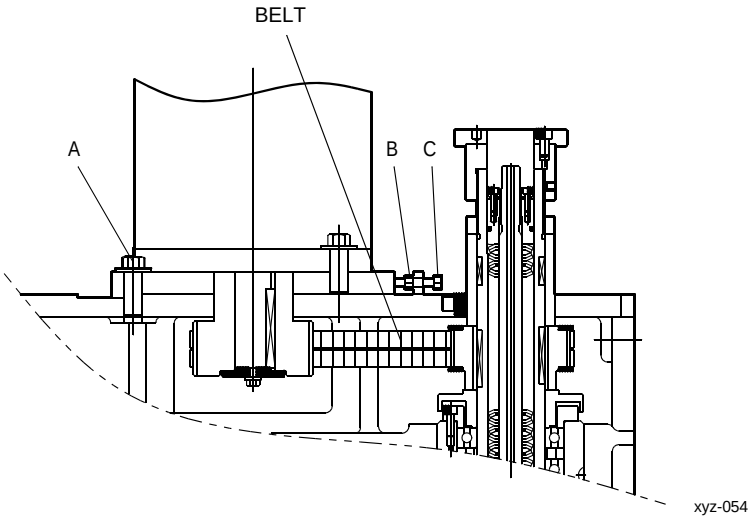


Figure 55 Spindle transmission belt tension

7.2 Adjustment of Table Gib

The taper gib ‘A’ is used for precise adjustment of the moving table, refer to Figure 56. The screw ‘B’ and ‘C’ is used to set the gib. To adjust the gib:

1. Turn the screw ‘C’ anti-clockwise to loosen the gib.
2. Turn the screw ‘B’ clockwise to adjust the gib until the table moves smoothly and precisely.
3. After adjustment is completed, tighten the screw ‘C’ to set the gib.

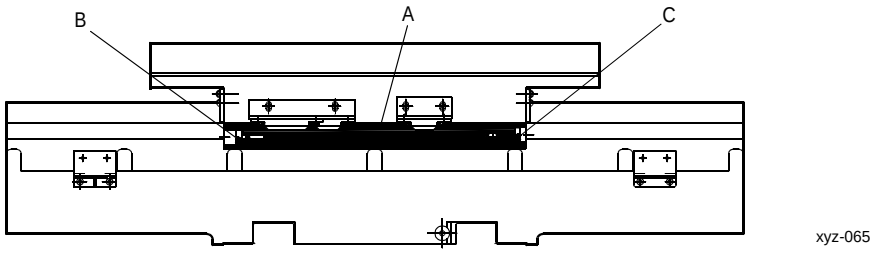


Figure 56 Adjustment of table gib

7.3 Adjustment of Saddle Gib

The taper gib ‘A’ is used for precise adjustment of the moving saddle, refer to Figure 57. The screw ‘B’ and ‘C’ is used to set the gib. To adjust the gib:

1. Turn the screw ‘C’ anti-clockwise to loosen the gib.
2. Turn the screw ‘B’ clockwise to adjust the gib until the table moves smoothly and precisely.
3. After adjustment is completed, tighten the screw ‘C’ to set the gib.

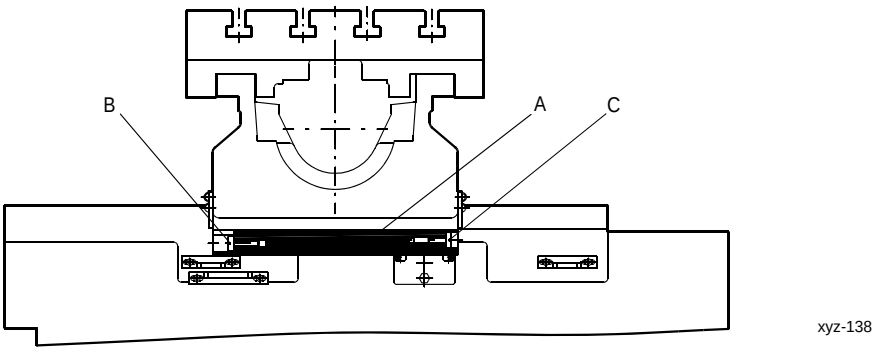


Figure 57 Adjustment of saddle gib

7.4 Adjustment of Headstock Gib

The taper gib ‘A’ is used for precise adjustment of the moving headstock, refer to Figure 58. The screw ‘B’ and ‘C’ is used to set the gib. To adjust the gib:

1. Turn the screw ‘C’ anti-clockwise to loosen the gib.
2. Turn the screw ‘B’ clockwise to adjust the gib until the table moves smoothly and precisely.
3. After adjustment is completed, tighten the screw ‘C’ to set the gib.

Note - Make sure you do the headstock gib adjustment at least once every month. Failure to do so can result in machine inaccuracy.

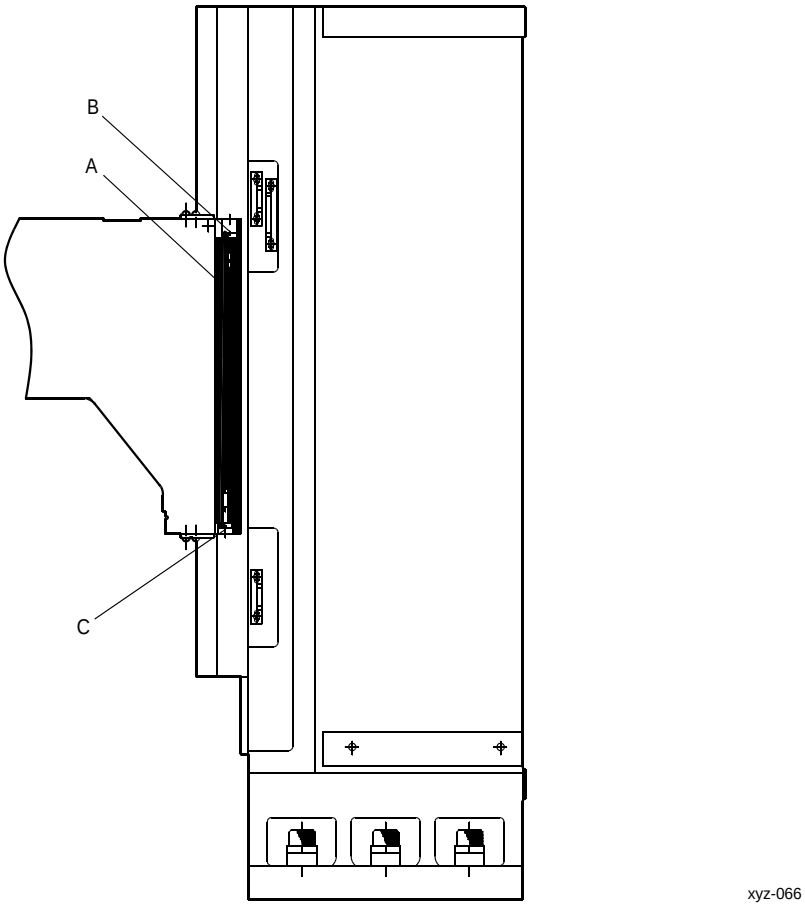


Figure 58 Adjustment of the headstock

7.5 Adjustment of the Square Between the Spindle Centre Line and the Table Surface

1. Set and hold the dial gauge directly under the spindle, refer to Figure 59.
2. Make sure the distance between the dial gauge probe and spindle center line is 160 mm.
3. Move the headstock along the Z direction until the dial gauge probe touches the working table surface.
4. Rotate the spindle and measure the value.
5. If any value is over the standard value, adjust the Machine.

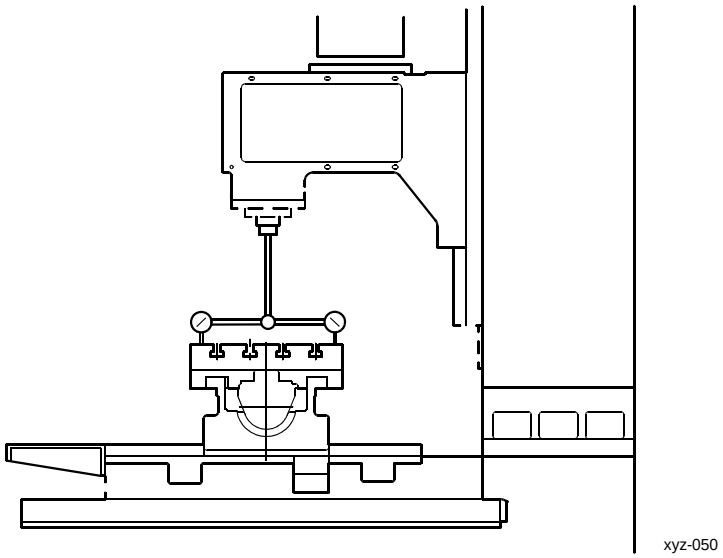


Figure 59 Adjusting the square between the spindle centre line and the working table

7.6 Adjust the Square Along the X, Y and Z Axes

1. Prepare the dial gauge set and square rule.
2. Position the square rule on the working table.
3. Fix the dial gauge set directly under the spindle, refer to Figure 60.
4. Move in X, Y and Z direction to level the machine until the readings at both ends are the same.
5. Measure the square along the three axes.
6. If the values are over the standard value, adjust the Machine.

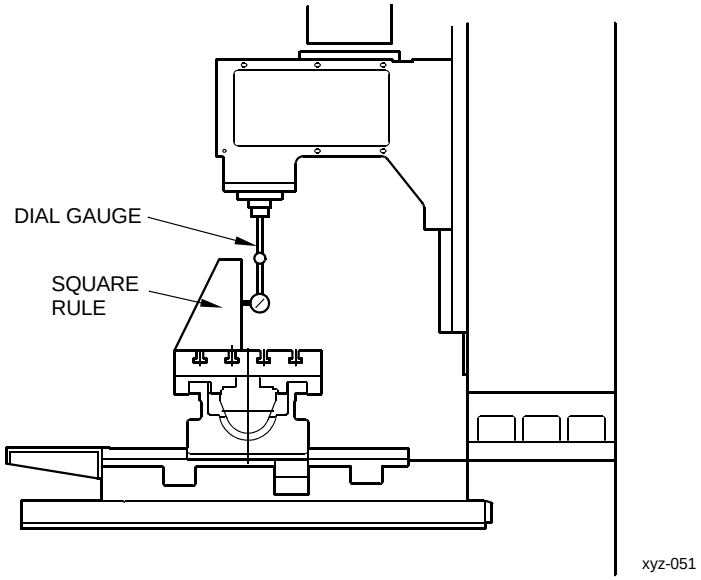


Figure 60 Adjusting the square along the X, Y, Z axes

7.7 Adjustment of Cam and Bearings

1. Loosen the screws of the left and right tuneup caps, see Figure 61.
2. Adjust the caps to move the cam up. The cam will make contact with the bearings.
3. Adjust the nut to move the cam left or right, see Figure 62.
4. Tighten the screws of the left and right tuneup caps.

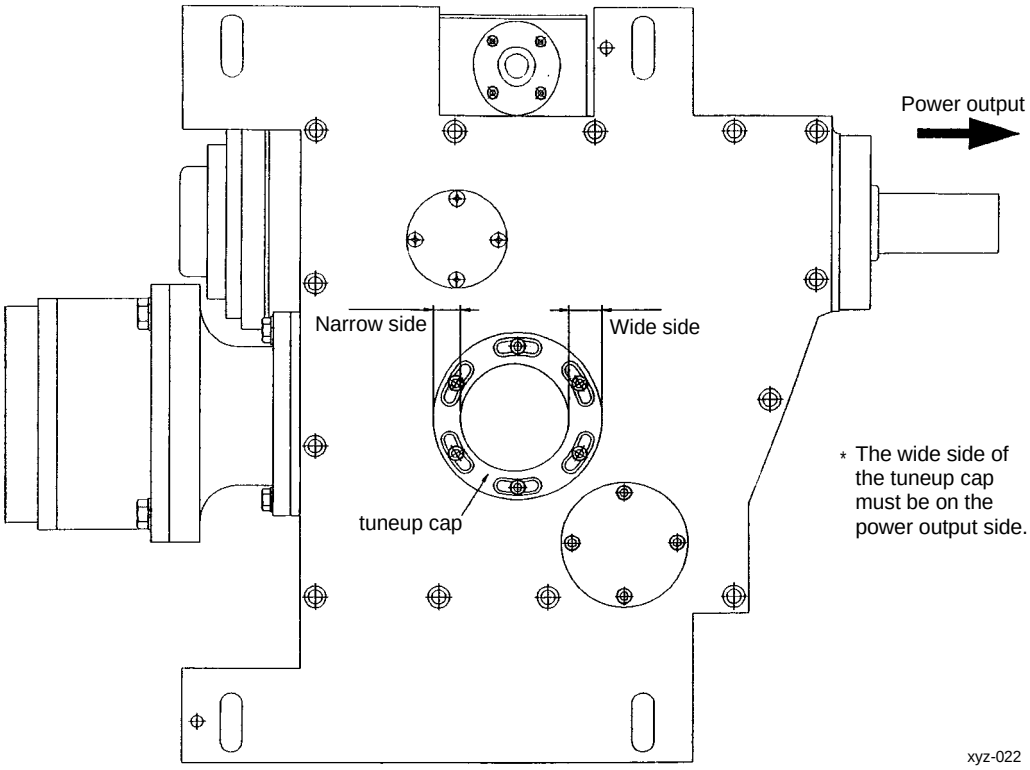


Figure 61 Adjustment of cam and bearings

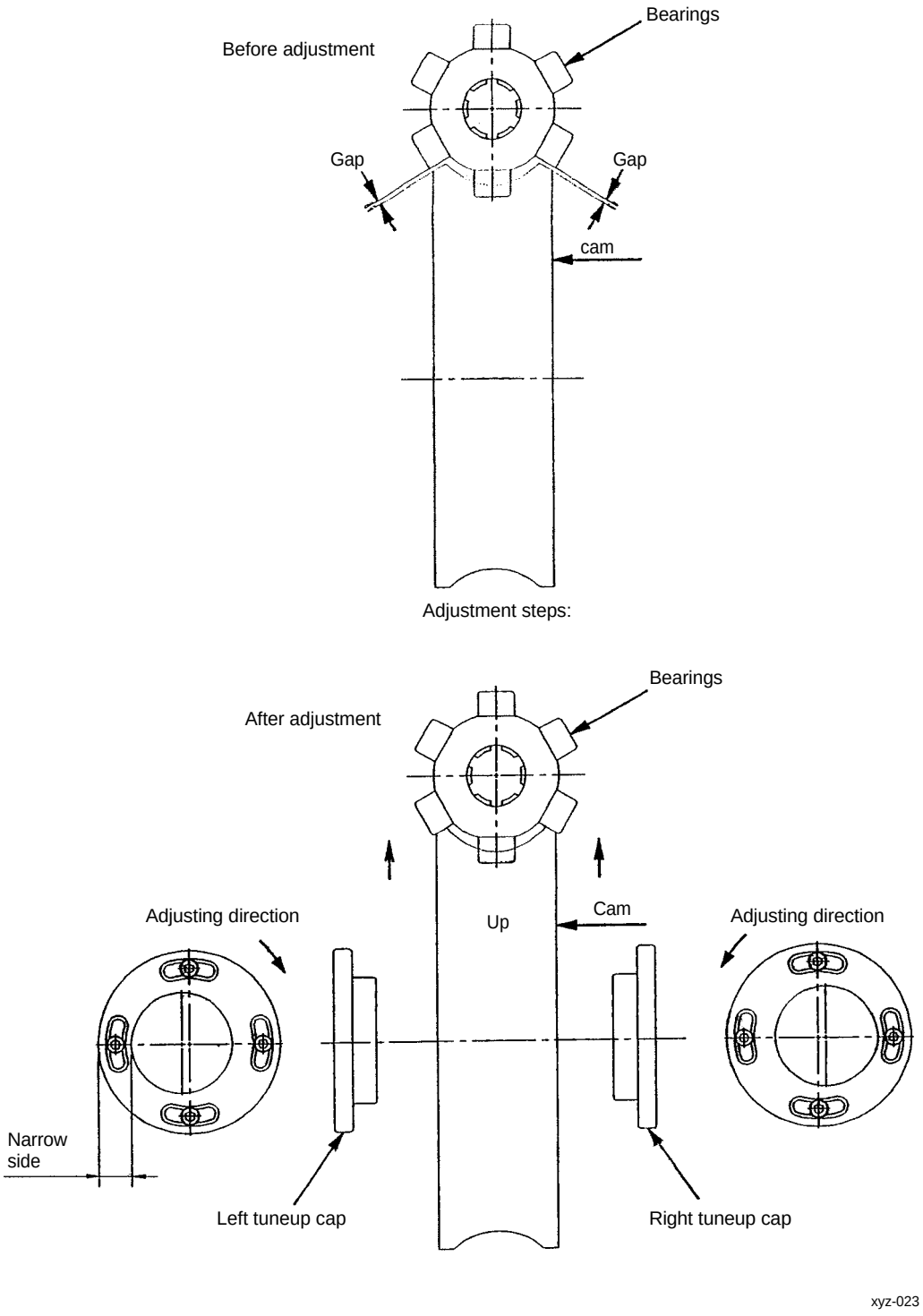


Figure 62 Adjustment of cam and bearings continued

7.8 Adjustment of the Rotary Tool Changer Arm

To do the adjustment of the arm on the rotary tool changer:

1. Push the clutch link down, refer to Figure 63.
2. Use the wrench to rotate the motor.
3. Turn the arm to the angle of the set up edged tool, refer to Section 6.10.4, Figure 54.
4. Adjust the arm to hold the edged tool.
5. Tighten the setup screws.

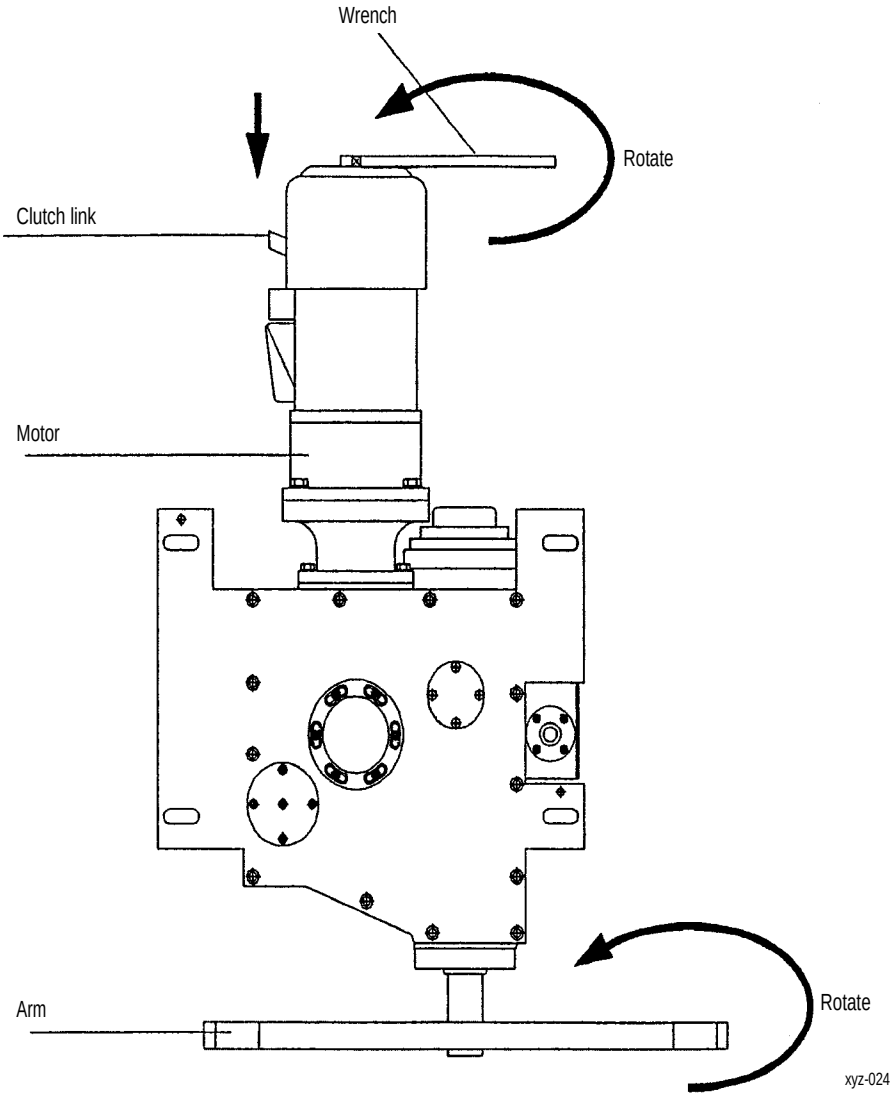


Figure 63 Adjustment of the rotary tool changer arm

8.0 Maintenance

8.1 Preparation Before Maintenance

1. Understand the safety instructions in this manual.
2. Maintain the Vertical Machining Center correctly.
3. Understand the maintenance procedures in this manual.
4. Obey the maintenance procedures and complete the maintenance records after the maintenance procedures have been done.

8.2 Centralized Lubrication System Maintenance

The operating conditions of the Machine depend heavily on maintenance of the centralized lubrication system. Check the lubrication system regularly to keep the Machine in a good, serviceable condition.

Regularly clean the oil tank of the centralized lubrication system. The oil tank will also require cleaning if any impurity is found at the bottom of the tank or in the filter of the oil suction set.

To clean the oil tank:

1. Loosen the screws which secure the oil tank to the lubricator.
2. Separate the oil tank from the lubricator.
3. Clean the oil tank.
4. Tighten the screws to secure the oil tank to the lubricator.

Keep the oil level between high and low. If the oil level is less than low, the centralized lubrication system will stop, and the alarm will sound or give a visual indication.

To fill the centralized lubrication system with oil, refer to Section 5.6.2.

The recommended lubrication oil to use in the pneumatic system, and the recommended lubrication grease and cutting coolant to use are listed in the oil guide table, refer to Section 8.3.4.

8.2.1 Warning System for the Centralized Lubrication System

The warning system is designed to inform users of when to check and fill up the slideway lubrication system. When the warning alarm message shows on the control panel, fill the tank immediately. The warning alarm will continue if the warning status is not stopped. Check the centralized lubrication system weekly, and fill the tank if necessary. The recommended lubrication oil is listed in the oil guide table, refer to Section 8.3.4.

8.3 Lubrication

8.3.1 Lubrication for the X, Y and Z Axis Bearings

Lubricate the bearings of the X-axis, Y-axis or Z-axis with grease. The recommended grease (Nbu 15) can be used in high temperature conditions and has a good lubrication property.

8.3.2 Lubrication for the X, Y and Z Axis Ballscrews

The working table, saddle, and headstock travel along the X,Y, and Z directions. The X-axis, Y-axis or Z-axis movement is driven by an AC servo motor through the connection of a coupling and a ballscrew. The ballscrews are pre-tensioned and lubricated with oil to avoid positional error which can result from thermal deformation.

8.3.3 Lubrication and Cooling of the Spindle System

1. Lubricate the spindle bearings with grease. The recommended grease (Nbu 15) can be used in high temperature conditions and has a good lubrication property.
2. Maintain a sufficient lubrication oil cooling level in the cooling system. Fill the system if necessary.
3. The spindle cooler (optional equipment) is used to cool the spindle bearing and protects the spindle system from thermal deformation.

8.3.4 Oil Guide Table

Note - Use the recommended fluid listed in the Oil Guide Table.

Lubricant Position	Slideway and Ballscrew	Cutting Coolant	Pressure Cylinder
Lubricant Characteristic	Viscosity ISO 32 Anti-wear, Anti-pressure	Good heat conductor Good lubricant performance	Viscosity ISO VG32 Anti-rust, anti-oxidation Good stability
Lubrication Method	Centralized Lub	Circulating Lub	
Oil Change Period	As required	As required	Every year
Tank Capacity	3 Litres	100 Litres	
Recommended Grade of Oil	ISO 32	CPC Cutting Oil 31C Mobil Esultran Esso Pennex 44 or Kulwell 30 or Dortan 32 Shell Dromus B or Macron 32	BP Energol HLP 32 AW Mobil DTE 13 Esso Auto A32 Shell Tellus 32 Chevron Ed Hydraulic 32

8.4 Machine Maintenance

Switch off the main power switch, the power switch of the Machine panel and the main power circuit breaker. Put ‘Under Maintenance. Do not touch any power switch’ warning signs in visible locations before starting the maintenance.

8.4.1 Notices

1. Only qualified engineers are allowed to maintain or install the electrical equipment.
2. Do not remove or alter the over-travel limit switches and related mechanical components without permission.
3. Use a ladder when working in a high place.
4. Make sure all appliances operate correctly.

8.4.2 Cleaning the Machine

1. Clean the anti-rust treatment on the contact surfaces of the moving machine parts with suitable cleaning agent.

2. **Do not use compressed air to remove debris from the machine, especially to remove swarf from the slideways**.
3. Remove the anti-moisture substances from the enclosures.
4. Clean the Machine and the work area. Put all items in their correct position.
5. Contact XYZ Machine Tools if any incorrect conditions are found during maintenance. Do not disassemble the Machine.

8.5 Preventative Maintenance

To keep the Machine in a good serviceable condition, follow the maintenance procedures in this manual.

8.5.1 Daily Maintenance

1. Make sure the quantity of oil in the centralized lubrication system is sufficient.
2. Make sure the quantity of cutting fluid in the fluid tank is sufficient.
3. Clean the Machine and work area after use. Apply a layer of rust-preventative oil to the exposed sliding surfaces.
4. Switch the power source off after use.
5. Release the water collected in the air filter cap.
6. Remove swarf from the Machine after use.
7. Check the spindle taper bore after use. Clean the spindle taper bore with the spindle taper bore cleaner.
8. If any problems occur, stop the Machine immediately and find the source of the problems.
9. Make sure no unusual noise occurs when the Machine is in operation.
10. Check and report any damage to vision windows.

8.5.2 Weekly Maintenance

1. Make sure all the pumps operate correctly.
2. Make sure the tool exchange system operates correctly.
3. Make sure the swivel disk of the tool magazine rotates correctly.

8.5.3 Monthly Maintenance

1. Check the gibs on the bed and cross slide. If necessary, adjust the gibs, refer to Section 7.2, Section 7.3 and Section 7.4.
2. Clean the cutting fluid pipes and lubrication oil pipes.
3. Clean the cutting oil tank and fill the tank with the recommended oil.
4. Check and clean the ballscrews.
5. Make sure all nuts and screws are secure.

8.5.4 Half Yearly Maintenance

1. Make sure the spindle run out and bearing clearances are within specification.
2. Make sure all nuts and screws are secure.

3. Make sure all electrical components, such as connectors, switches and cables, are in a good, serviceable condition.
4. Check and record the insulation resistors.
5. Make sure the tool exchanger does not obstruct the spindle.

8.5.5 Yearly Maintenance

1. Make sure the push buttons and switches on the control panel operate correctly.
2. Remove the carbon deposits from the electrical relay points. Clean the electrical relay points with isopropanol cleaning solvent.
3. Make sure the balance chains are in a good, serviceable condition.
4. Clean the hydraulic system, including the oil tank. When clean, fill the oil tank with the correct oil and make sure the pressure settings are correct.
5. Check the machine level and adjust if necessary. For machine levelling, refer to Section 5.4.
6. Make sure all electrical wire connections are secure.
7. If necessary, replace the oil in the spindle cooler system.

8.5.6 Three Yearly Maintenance

1. Lexan vision panels should be replaced every three years as their impact resistance deteriorates with age.

8.6 Rotary Tool Changer Maintenance

8.6.1 To Remove a Tool from the Rotary Tool Changer

1. Put the wrench (M08) between the tool pocket and the tool. Refer to Figure 64 and Figure 65.
2. Push the wrench forward to withdraw the tool from the tool pocket.

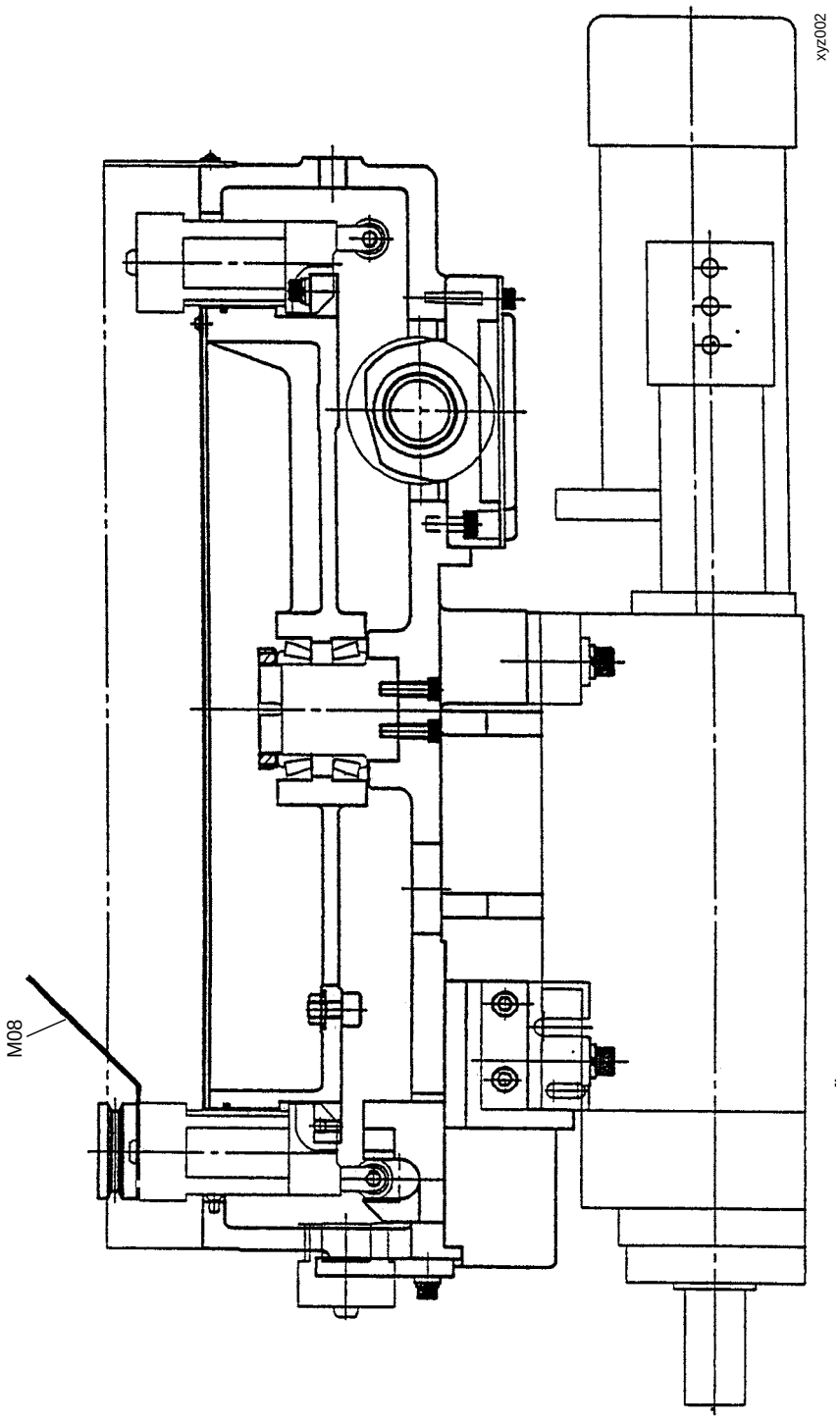


Figure 64 Tool removal from the rotary tool changer

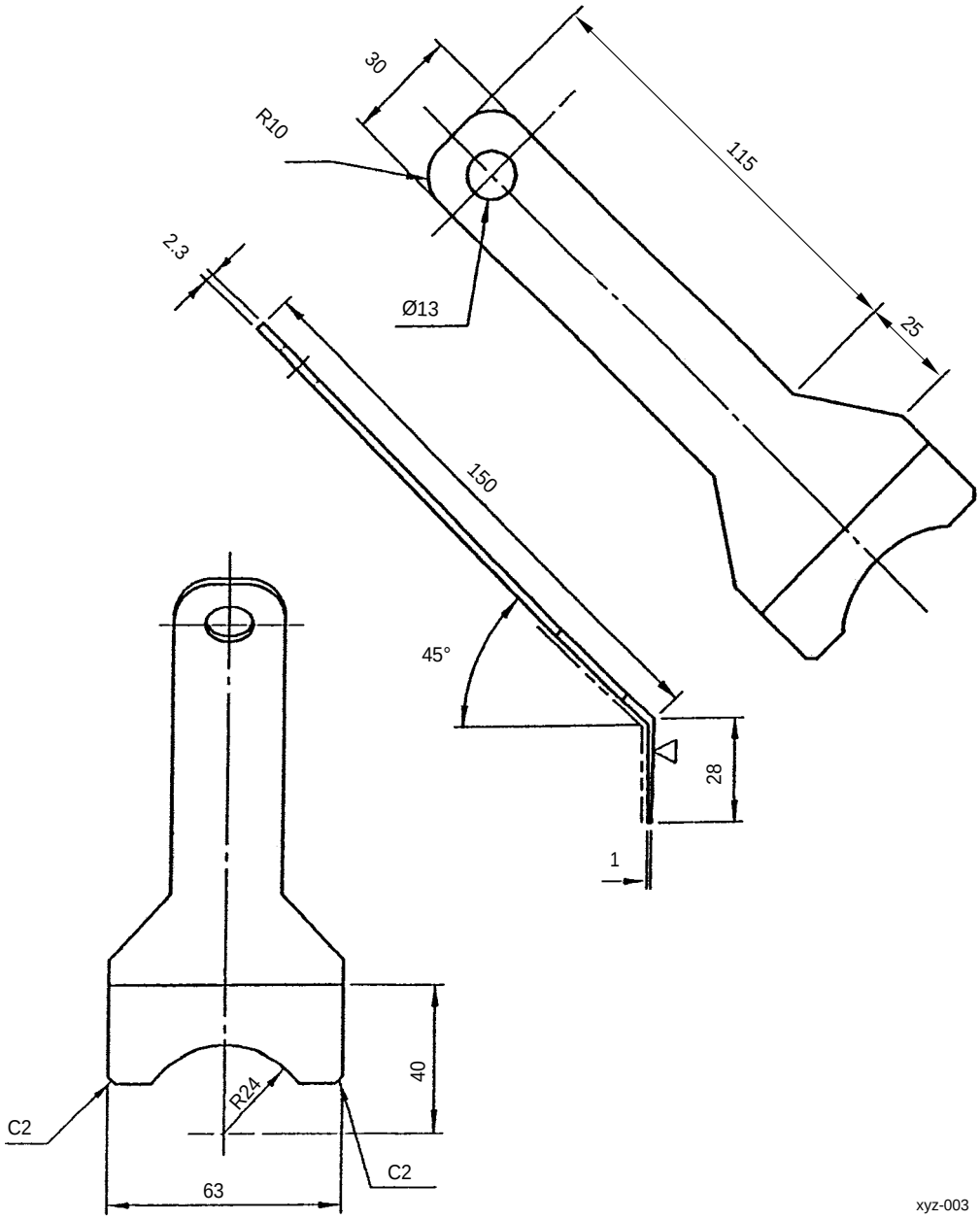


Figure 65 Tool removal wrench

8.6.2 Remove the Spline (Output) Shaft

1. Remove the case cap of the hexagonal screw (227) and remove the pin (246), refer to Figure 66 and Figure 67.
2. Remove the case cap (101B).
3. Loosen the hexagonal screw (225) and remove the front fix cap (111).
4. Remove the spline (output) shaft (106), transmit wheel (107), sun's nut (208), sun's gasket (210).
5. To install the spline (output) shaft, do the reverse of the removal procedure above.

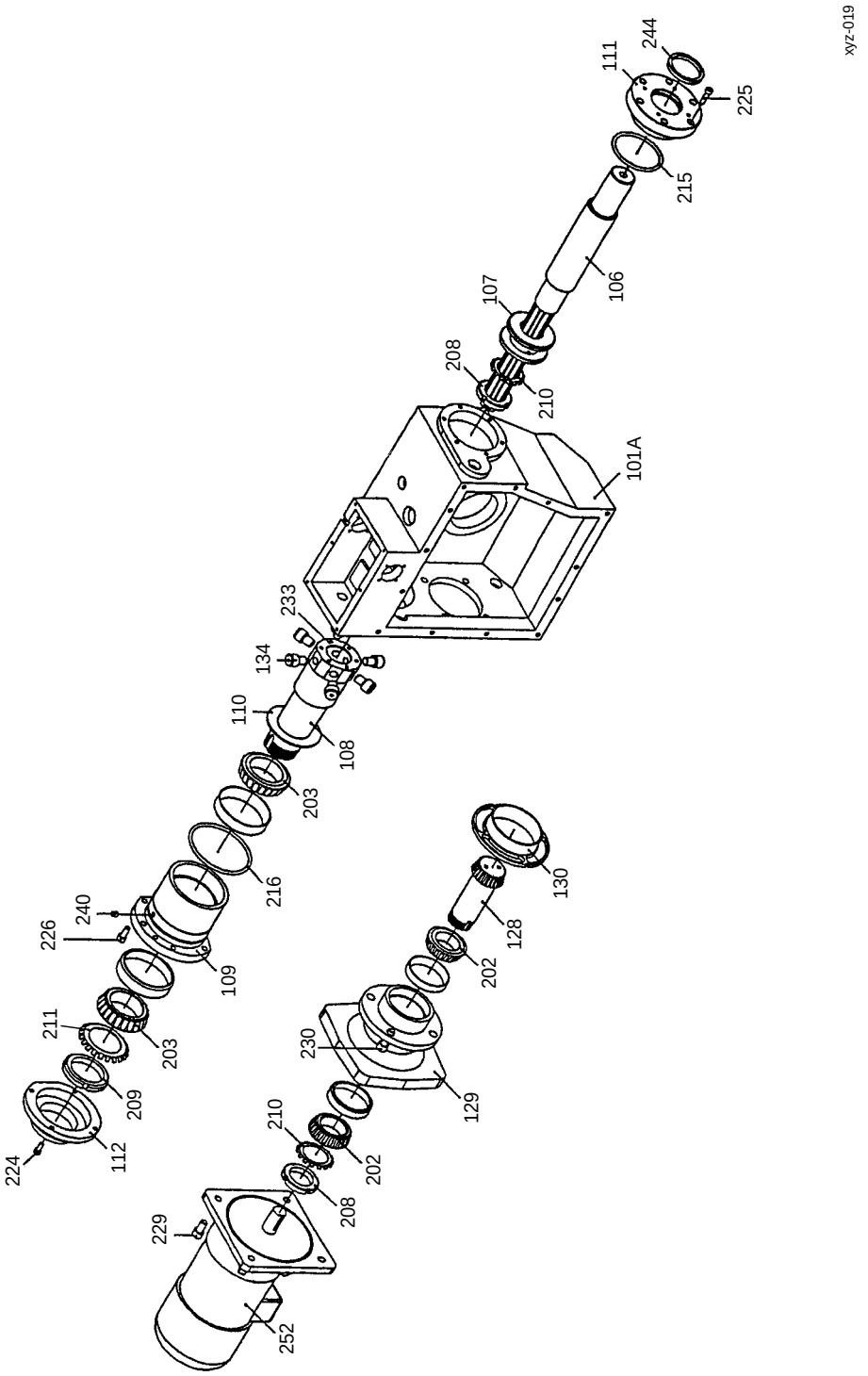


Figure 66 Removal of the spline (output) shaft

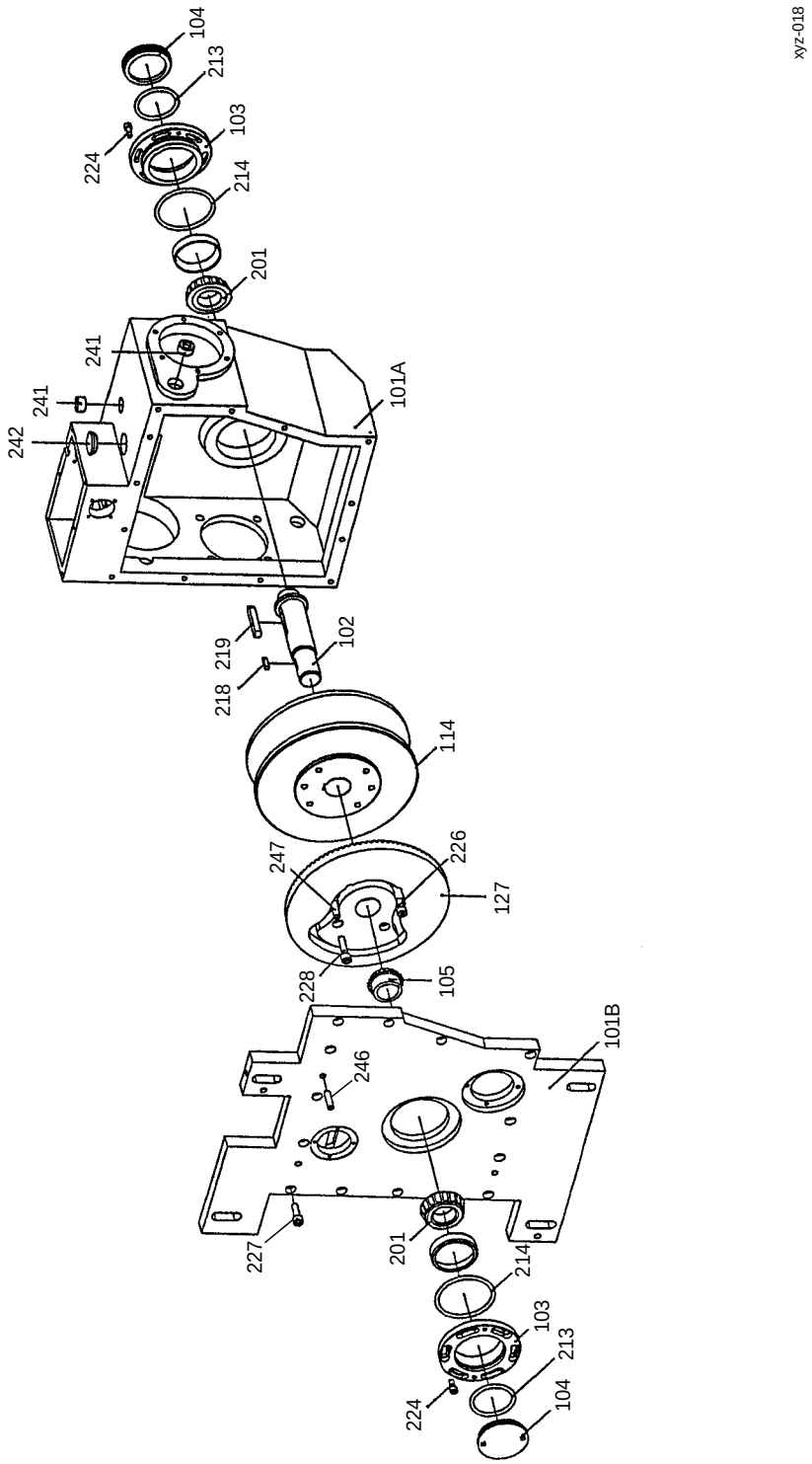


Figure 67 Replacement of the bearings on the bearings tube

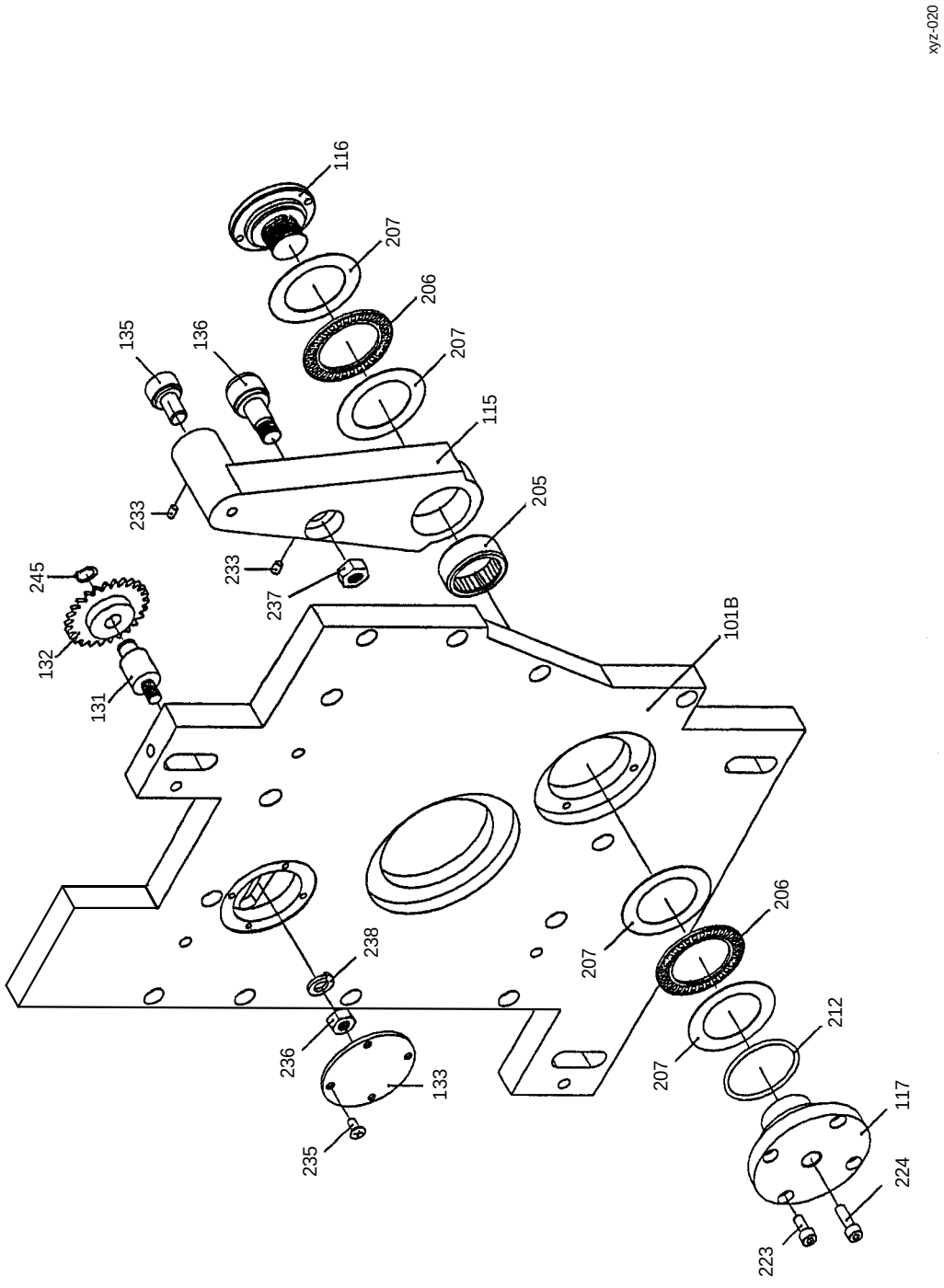


Figure 68 Removal of the rocker

9.0 Fault Finding

9.1 Fault Finding the BT40 Rotary Tool Changer

Fault	Cause	Rectification
Damaged tool pocket.	1.Tool catches pocket during tool change. 2. Tool misses tool pocket during tool change.	1. Motor or manually rotate the tool magazine to allow access to the faulty tool pocket. 2. Use the hexagonal wrench to loosen cap screw (item 1006), refer to Figure 89. 3. Replace pocket and tool.
The driving motor does not operate.	Motor burnt out/Wiring problem.	1. Switch off the machine and isolated power. 2. Check wiring. 3. If necessary, remove screw (1036), refer to Figure 90, and replace motor. Replace screw (1036).
	Tool weight is greater than 192 kg (423 lb).	Reduce the tool weight.
	Tool magazine incorrectly loaded.	Load magazine tools correctly.
The tool pocket does not operate correctly.	Air/oil pressure low.	1. Check air/oil pressure. 2. Replenish if necessary.
	Cylinder leak.	Replace cylinder.
	Adjusting screw (1072) loose.	Tighten adjusting screw (1072), refer to Figure 91.
	Tool weight over 8 kg.	Make sure tool weight is less than 8 kg.
	Tool length over 300 mm.	Make sure tool length is less than 300 mm.
Tool magazine does not run.	No power supply.	Check power is connected.
	Low air pressure.	Check air supply is connected and within limits.
	Sensor and limit switches faulty.	1. Check all sensors and limit switches. 2. If necessary, replace sensor and limit switches.
	Line isn't well contacted.	

Fault	Cause	Rectification
During tool changes, tool does not change correctly.	Tool change arm is damaged.	Replace tool change arm.
	Tool weight over 8 kg.	Make sure tool weight is less than 8 kg.
	Tool pocket clamping and compression spring fatigued.	Replace spring.
	Tool clamping point incorrect.	Do adjust of rotary tool changer arm refer to Section 7.8.
During tool fall, the tool drops.	Tool exceeds tool length/tool weight limits.	Make sure tool is within tool limits.
	Clamping force of the pocket spring too low.	Replace pocket spring.
	Tool falling block and pocket misaligned.	Use adjusting screw (1072), refer to Figure 91, to align falling block and pocket.
During tool change the tool does not return.	Change arm damaged.	1. Use wrench to manually rotate ATC and confirm if the tool clamping position is correct. 2. If height is correct and tool does not return, replace change arm.
	Line isn't well contacted.	
	Tool clamping and releasing message is not sent.	Adjust sensor.

9.2 Fault Finding the Centralised Lubrication System

Note - Turn off power before you check, repair or maintain the continuous lubricator.

Note - If the fault is not listed in the fault finding table, contact XYZ Machine Tools for advice.

Fault	Cause	Rectification
Indicator lamps do not illuminate.	No power.	Check power supply.
	Lamps fault.	Replace lamps.
	Incorrect voltage.	Use correct voltage.
Indicator lamps illuminate but oil does not discharge.	Oil level switch faulty.	Replace oil level switch.
	Oil level too low.	Replenish oil to correct level.
	Pump motor does not operate.	Replace pump motor.
Oil discharge low.	Blocked filter.	Clean the oil suction set.
	Oil viscosity incorrect.	Replace oil with correct type.
Motor does not operate.	Incorrect voltage.	Use correct voltage.
	Pump contaminated with water.	Clean pump or replace pump as necessary.
	Gear pump fault.	Replace oil.

Fault	Cause	Rectification
During operation oil leaks from the pipe adaptor and oil pipe connection.	Incorrect installation.	Remove and replace the olive so that at least 1mm of hose protrudes over the olive and refit to the elbow connector.
Pump operates but does not discharge oil.	Air in oil hosing.	1. Wait for approximately 1 minute. 2. If no discharge of oil, loosen the compression nut on elbow joint to allow air to escape. 3. When oil flows from elbow joint, tighten the compression nut. 4. Check for correct operation.
	Gear pump blocked.	1. Remove piping. 2. Switch on power. 3. Check to see if oil is discharged from gear pump. 4. If no oil discharge, clean or replace gear pump. 5. Install piping. 6. Check for correct operation.
	Oil piping blocked or damaged.	1. Remove oil pipe. 2. During removal, switch on power to see if oil is discharged. 3. Switch power off after every oil discharge check. 4. When faulty pipe is found, replace pipe. 5. Install piping. 6. Check for correct operation.
	Faulty pressure switch or limit switch.	1. Check oil pressure. 2. If oil pressure incorrect see 4. 3. If oil pressure correct see 5. 4. Possible blocked or damaged oil pipe. 5. Possible faulty pressure or limit switch, contact XYZ Machine Tools for advice.

10.0 Parts List

10.1 XYZ Mini Mill 560 Parts List

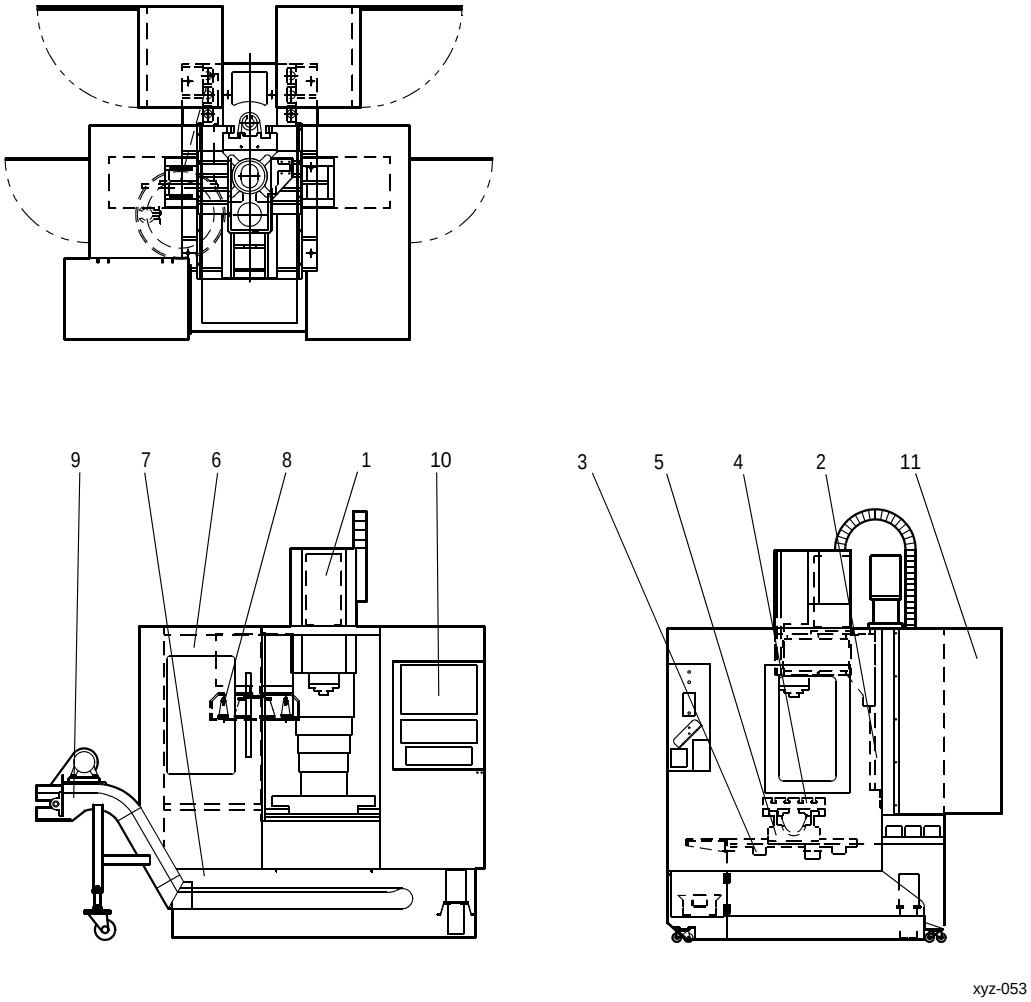


Figure 69 XYZ Mini Mill 560 assembly

10.1.1 XYZ Mini Mill 560 Assembly

Item No	Part Number	Description	Remarks
1		Head	
2		Main Column	
3		Bed Base	
4		Working Table	
5		Saddle	
6		Shield Cover	
7		Coolant Tank	
8		Tool Magazine	
9		Chip Conveyor	
10		Operation Panel	
11		Electrical Cabinet	

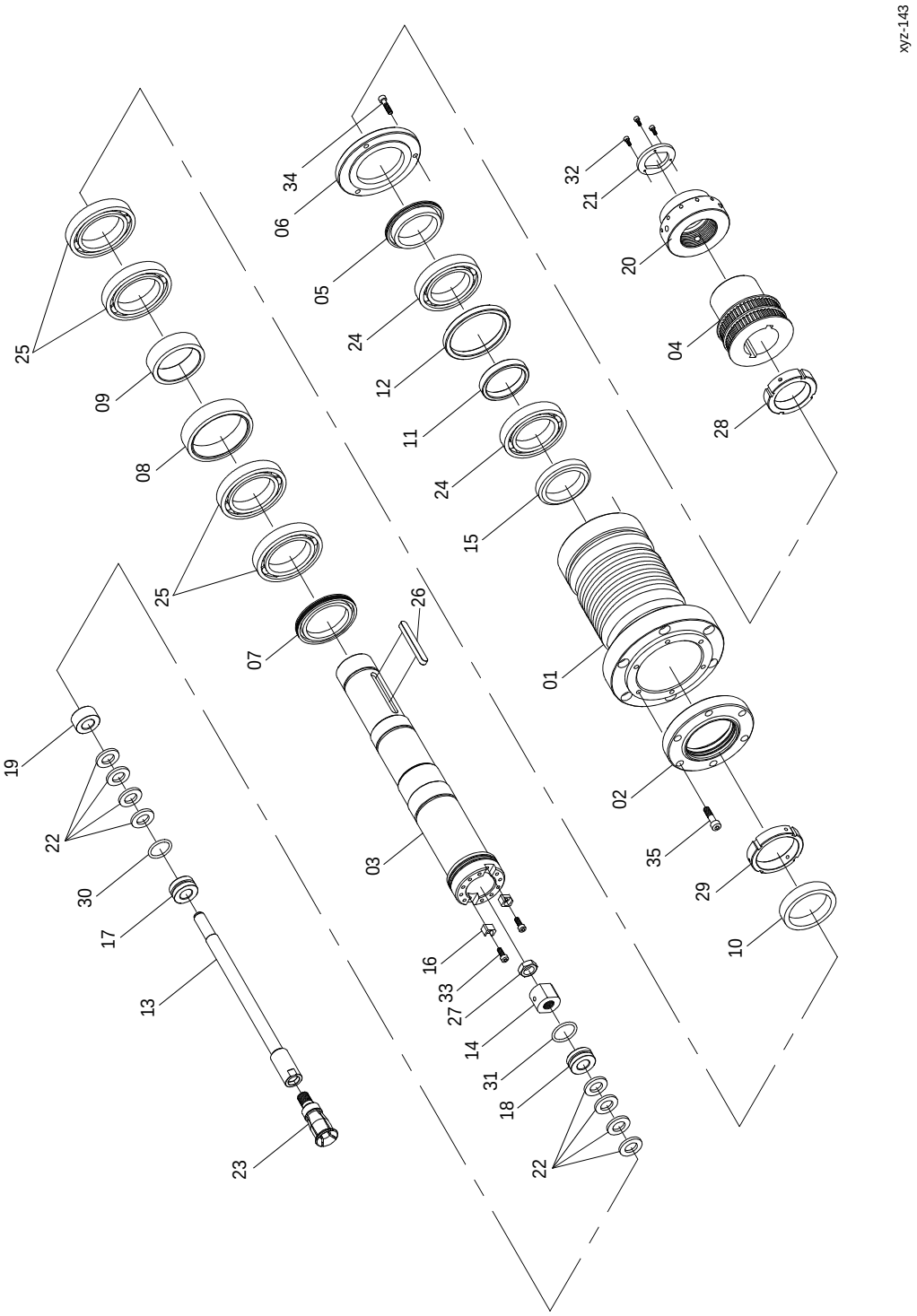


Figure 70 Spindle drive assembly

10.1.2 Spindle Drive Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS010053	Spindle Housing	1	
2	MS010061	Front Bearing Cover	1	
3	MT010013	Spindle	1	
4	MT010030	Spindle Pulley	1	
5	MT010070	Spacer	1	
6	MT010080	Rear Bearing Cover	1	
7	MT001090	Shaft Cover	1	
8	MT010100	Spacer	1	
9	MT010110	Spacer	1	
10	MT010120	Spacer	1	
11	MT010130	Spacer	1	
12	MT010140	Spacer	1	
13	MT010161	Pull Rod	1	
14	MT010171	Lock Nut	1	
15	MT010210	Spacer	1	
16	MT010220	Bracket	2	
17	MT010230	Front Bearing Cover	1	
18	MT010250	Spacer	1	
19	MT010261	Spacer	2	
20	MT020082	Nut	1	
21	MT020092	Fixed Plate	1	
22	A600000130	Dish Spring	87	
23	A70000040	Gripper	1	
24	AB7012	Ball Bearing	2	7012
25	AB7013	Ball Bearing	4	7013
26	AK1008070	Key	1	10x8x70L
27	ANM115016	Nut	1	M16x1.5
28	ANN420060	Lock Nut	1	M60x2.0
29	ANN420065	Lock Nut	1	M65x2.0
30	AOR350307	Oil Ring	1	Ø30.7x3.5
31	AOR350312	Oil Ring	1	Ø31.2x3.5
32	ASM604010	Hexagon Socket Cap Hd Screw	3	M4x10L
33	ASM606016	Hexagon Socket Cap Hd Screw	2	M6x16L
34	ASM606025	Hexagon Socket Cap Hd Screw	3	M6x25L

Item No	Part Number	Description	Quantity	Remarks
35	ASM608030	Hexagon Socket Cap Hd Screw	6	M8x30L

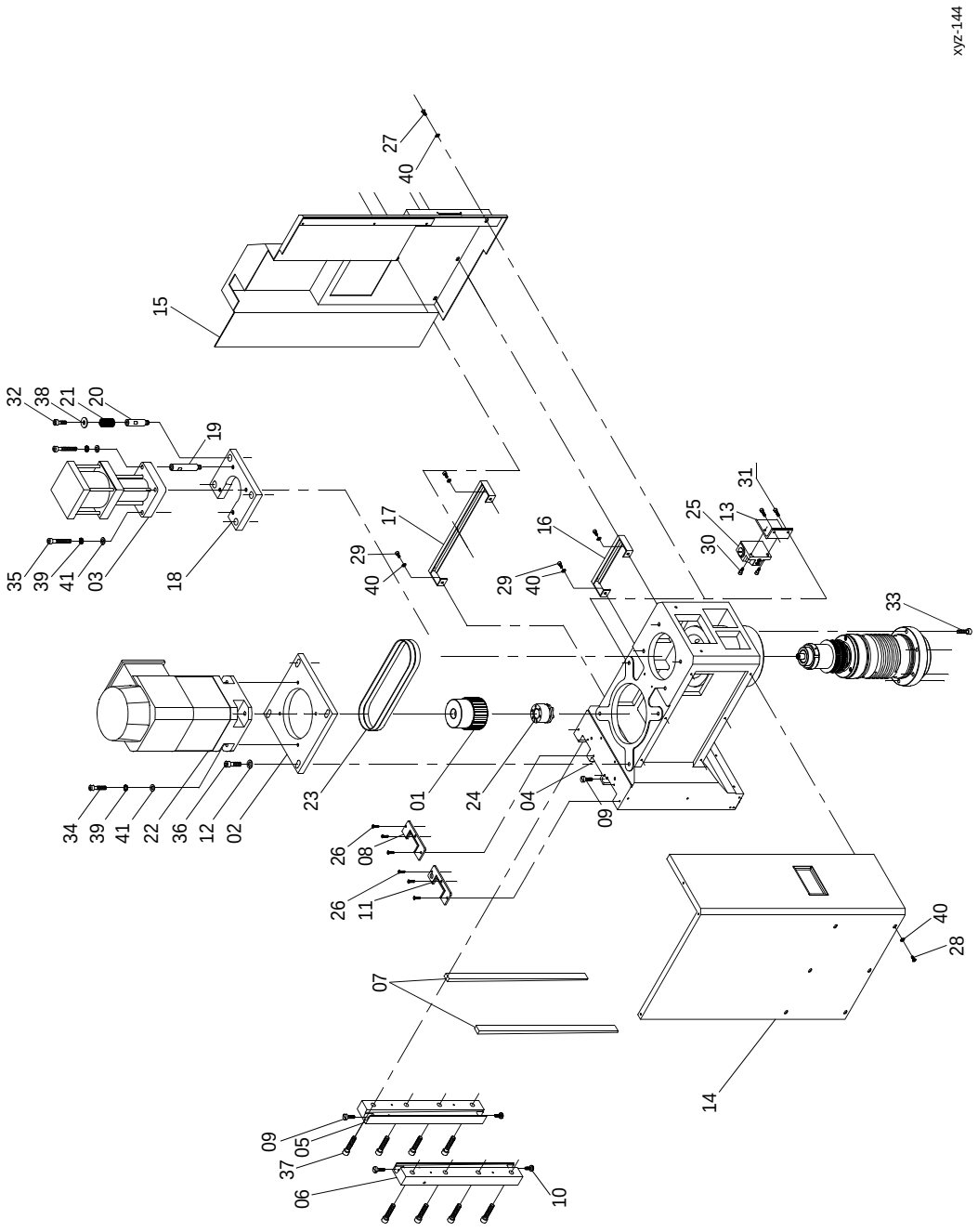


Figure 71 Head assembly

10.1.3 Head Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS010022	Motor Pulley	1	
2	MS010041	Spindle Motor Bracket	1	
3	MS010300	Air Unclamping Cylinder	1	
4	MS020010	Head Stock	1	
5	MS020020	Gib Seat	1	
6	MS020030	Gib Seat	1	
7	MS020040	Gib	2	
8	MS020060	Cross Slide Wiper	3	
9	MS020120	Adjust Screw	3	
10	MS020130	Adjust Screw	2	
11	MS020160	Cross Slide Wiper (Up)	1	
12	MS020190	Bright Washer	4	M12
13	MS130100	Limit Switch Bracket	1	
14	MS420020	Guard	1	
15	MS420030	Guard	1	
16	MS420060	Bracket	1	
17	MS420070	Bracket	2	
18	ML020070	Tool Ejector Bracket	1	
19	MT020100	Support Bolt	4	
20	MT020110	Bolt	4	
21	MT020180	Compression Spring	4	Ø24.5
22	AMOS322010	Motor	1	
23	ABE0500825	Belt	2	5GT-825-15
24	A600001010	Coupling	1	
25	ED610030	Limit Switch	1	BNS 819-B02-L-12-61-12-10
26	ASM105020	Button Head Cap Screw	12	M5x20L
27	ASM106010	Button Head Cap Screw	3	M6x10L
28	ASM106016	Button Head Cap Screw	8	M6x16L
29	ASM606012	Hexagon Socket Cap Hd Screw	4	M6x12L
30	ASM606015	Hexagon Socket Cap Hd Screw	2	M6x15L
31	ASM606020	Hexagon Socket Cap Hd Screw	2	M6x20L
32	ASM610030	Hexagon Socket Cap Hd Screw	4	M10x30L

Item No	Part Number	Description	Quantity	Remarks
33	ASM610035	Hexagon Socket Cap Hd Screw	6	M10x35L
34	ASM610045	Hexagon Socket Cap Hd Screw	4	M10x45L
35	ASM610070	Hexagon Socket Cap Hd Screw	4	M10x70L
36	ASM612040	Hexagon Socket Cap Hd Screw	4	M12x40L
37	ASM612055	Hexagon Socket Cap Hd Screw	8	M12x55L
38	AWMH01010	Height Bright Washer	4	M10
39	AWMS01010	Spring Washer	8	M10
40	AWMT01006	Bright Washer	15	M6
41	AWMT01010	Bright Washer	8	M10

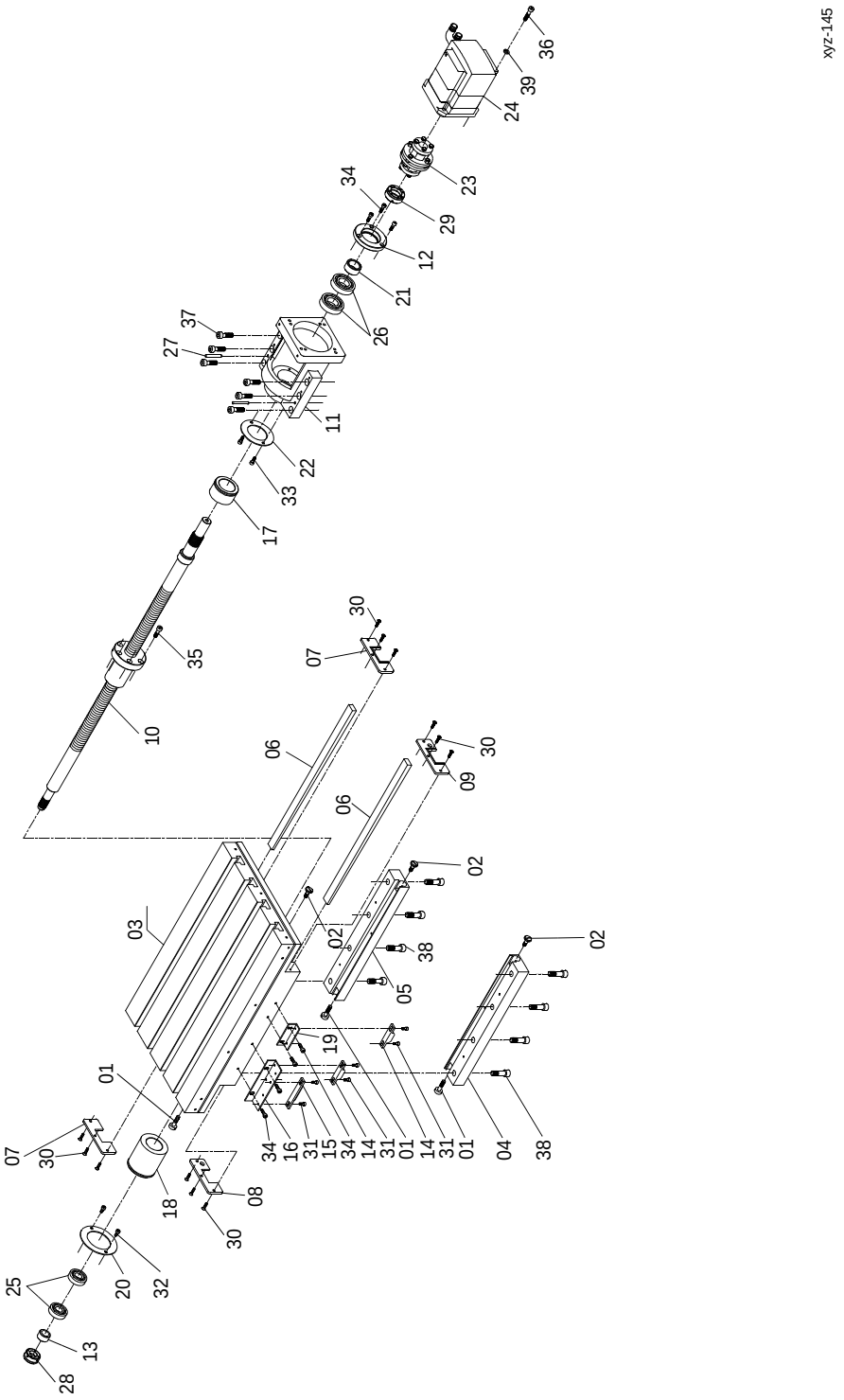


Figure 72 Table assembly

10.1.4 Table Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS020120	Adjust Screw	3	
2	MS020130	Adjust Screw	3	
3	MS060011	Table	1	
4	MS060020	Gib Seat	1	
5	MS060030	Gib Seat	1	
6	MS060040	Gib	2	
7	MS060060	Cross Slide Wiper	2	
8	MS060070	Cross Slide Wiper	1	
9	MS060080	Cross Slide Wiper	1	
10	MS110010	X Axis Ball Screw	1	
11	MS110020	Motor Bracket	1	
12	MS110030	Bearing Cover	1	
13	MS110080	Shaft Cover	1	
14	MS110090	Limit Switch Dog	2	
15	MS110100	Limit Switch Dog	1	
16	MS110110	Limit Switch Base	1	
17	MS110120	X Axis Rear Housing Cover	1	
18	MS110130	X Axis Rear Housing Cover	1	
19	MS110170	Limit Switch Base	1	
20	MS110180	Cover	1	
21	MS130080	Shaft Cover	1	
22	MS130150	Cover	1	
23	A600001020	Coupling Ø25	1	CPT62425
24		Motor	1	1FK7060-5
25	AB204760	Ball Bearing	2	20BS47DH
26	AB306260	Ball Bearing	2	30BS62DH
27	AKP106040	Pin	2	Ø6X40L
28	ANN515020	Lock Nut	1	M20x1.5
29	ANN515030	Lock Nut	1	M30x1.5
30	ASM105020	Button Head Cap Screw	12	M5x20L
31	ASM605012	Button Head Cap Screw	6	M5x12L
32	ASM606012	Hexagon Socket Cap Hd Screw	2	M6x12L
33	ASM606016	Hexagon Socket Cap Hd Screw	2	M6x16L
34	ASM606020	Hexagon Socket Cap Hd Screw	6	M6x20L

Item No	Part Number	Description	Quantity	Remarks
35	ASM608025	Hexagon Socket Cap Hd Screw	5	M8x25L
36	ASM608035	Hexagon Socket Cap Hd Screw	4	M8x35L
37	ASM610035	Hexagon Socket Cap Hd Screw	6	M10x35L
38	ASM612040	Hexagon Socket Cap Hd Screw	8	M12x40L
39	AWMH01008	Washer	4	M8

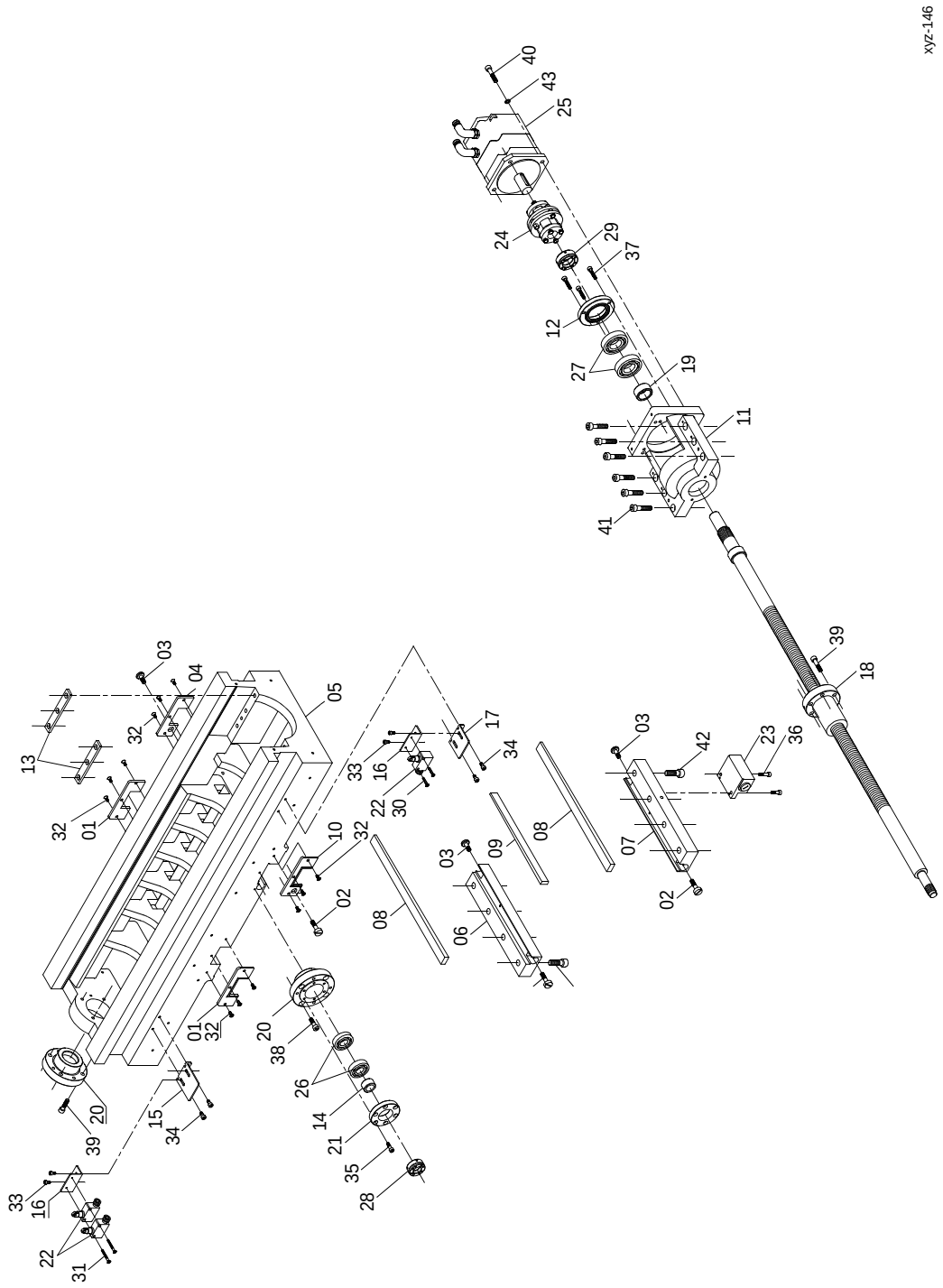


Figure 73 Saddle assembly

10.1.5 Saddle Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS020060	Cross Slide Wiper	2	
2	MS020120	Adjust Screw	3	
3	MS020130	Adjust Screw	3	
4	MS020170	Cross Slide Wiper	1	
5	MS050010	Saddle	1	
6	MS050020	Gib Seat	1	
7	MS050030	Gib Seat	1	
8	MS050040	Gib	2	
9	MS050050	Gib	1	
10	MS050060	Cross Slide Wiper	1	
11	MS110020	Motor Bracket	1	
12	MS110030	Bearing Cover	1	
13	MS110070	Spacer	2	
14	MS110080	Spacer	1	
15	MS110140	Limit Switch Base	1	
16	MS110150	Limit Switch Base	2	
17	MS110160	Limit Switch Base	1	
18	MS120010	Y Axis Ball Screw	1	
19	MS130080	Spacer	1	
20	MT110040	Bearing Bracket	2	
21	MT110050	Bearing Cover	1	
22	ED610040	Limit Switch	3	SL1-A
23	ED610030	Limit Switch	1	BNS-819-B02-L12-61-12-10
24	A600001020	Coupling Ø25	1	CPT62425
25		Motor	1	1FK7060-5
26	AB204760	Ball Bearing	2	20BS47DH
27	AB306260	Ball Bearing	2	30BS62DH
28	ANN510020	Lock Nut	1	YSK M20x1.0
29	ANN515030	Lock Nut	1	YSK M30x1.5
30	ASM104025	Button Head Cap Screw	2	M4x25L
31	ASM104040	Button Head Cap Screw	2	M4x40L
32	ASM105012	Button Head Cap Screw	12	M5x12L
33	ASM605010	Hexagon Socket Cap Hd Screw	4	M5x10L
34	ASM606012	Hexagon Socket Cap Hd Screw	4	M6x12L

Item No	Part Number	Description	Quantity	Remarks
35	ASM606020	Hexagon Socket Cap Hd Screw	7	M6x20L
36	ASM606025	Hexagon Socket Cap Hd Screw	1	M6x25L
37	ASM606030	Hexagon Socket Cap Hd Screw	3	M6x30L
38	ASM608025	Hexagon Socket Cap Hd Screw	4	M8x35L
39	ASM608035	Hexagon Socket Cap Hd Screw	9	M8x35L
40	ASM608040	Hexagon Socket Cap Hd Screw	4	M8x40L
41	ASM610045	Hexagon Socket Cap Hd Screw	6	M10x45L
42	ASM612035	Hexagon Socket Cap Hd Screw	8	M12x35L
43	AWMH01008	Height Bright Washer	4	M8

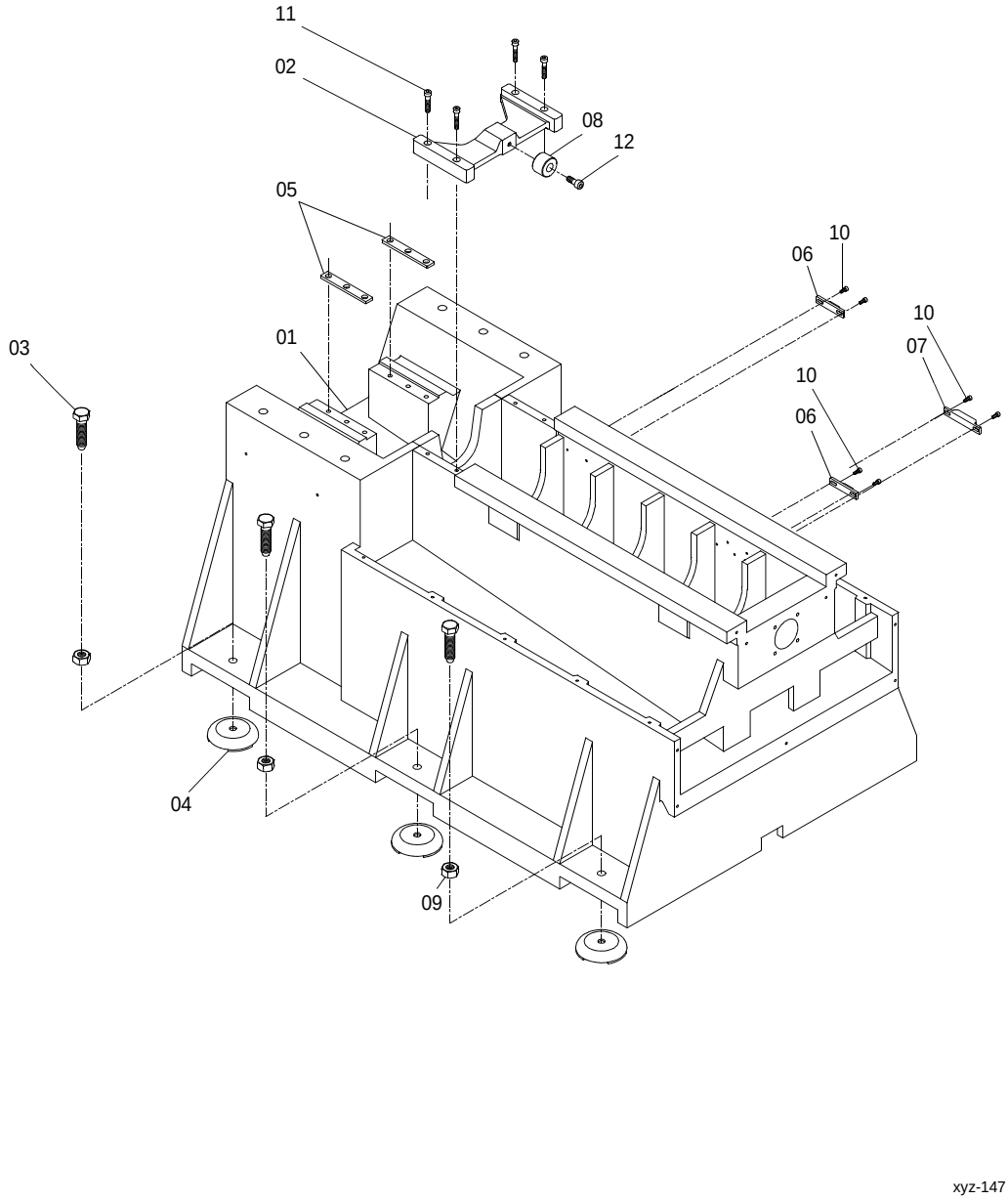


Figure 74 Base assembly

10.1.6 Base Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS040010	Base	1	
2	MS040020	Y Axis Bracket	1	
3	MS040030	Bolt	6	
4	MS040040	Block	6	
5	MS110070	Spacer	2	
6	MS110090	Limit Switch Dog	2	
7	MS110100	Limit Switch Dog	1	
8	MS130120	Rear Housing Cover	1	
9	ANI110034	Nut	6	3/4”-10NC
10	ASM605012	Hexagon Socket Cap Hd Screw	6	M5x12L
11	ASM608040	Hexagon Socket Cap Hd Screw	4	M8x40L
12	ASM610025	Hexagon Socket Cap Hd Screw	1	M10x25L

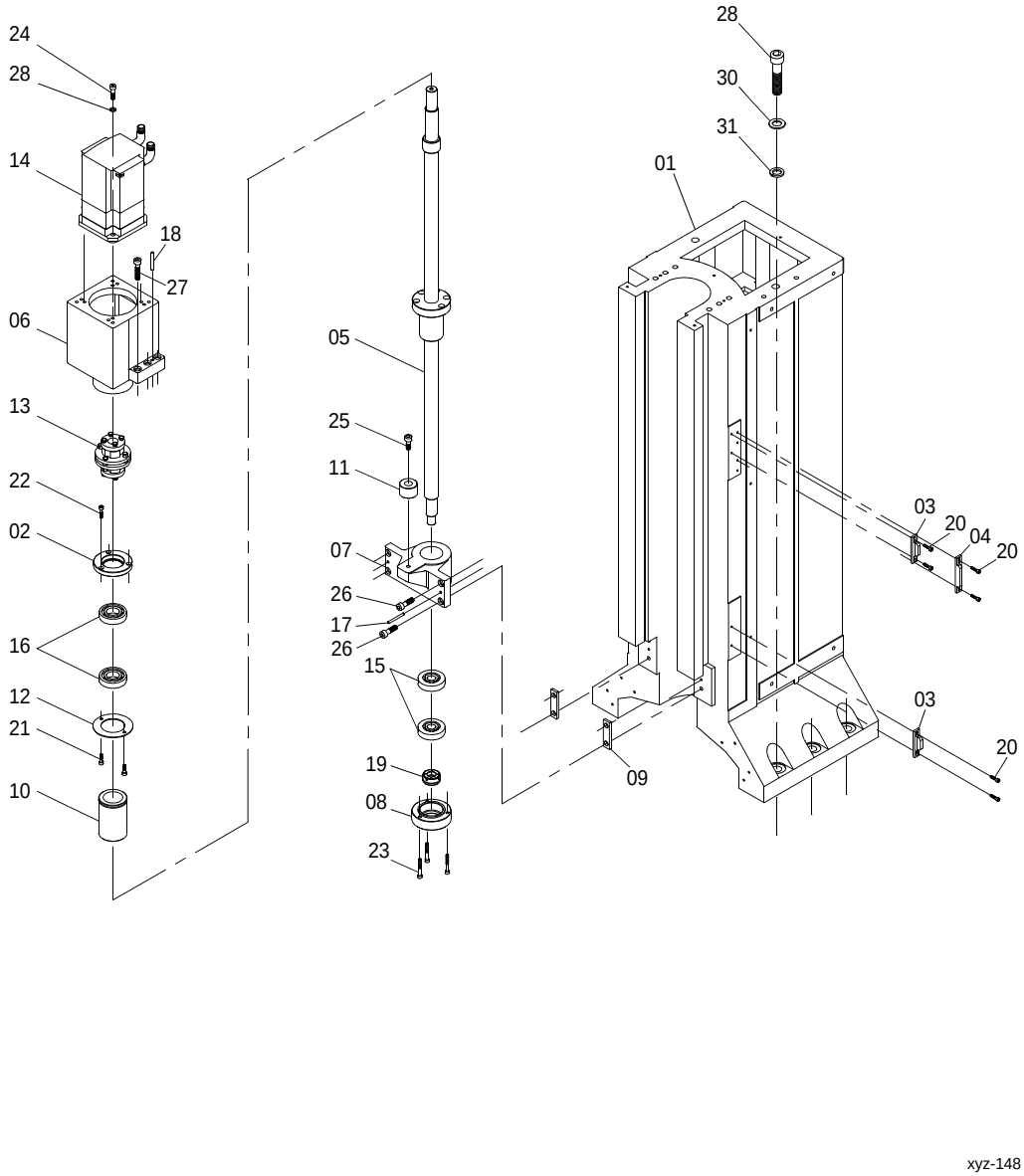


Figure 75 Column assembly

10.1.7 Column Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS030010	Column	1	
2	MS110030	Bearing Cover	1	
3	MS110090	Limit Switch Dog	2	
4	MS110100	Limit Switch Dog	1	
5	MS130010	Z Axis Ball Screw	1	
6	MS130020	Motor Bracket	1	
7	MS130040	Bearing Bracket	1	
8	MS130050	Bearing Cover	1	
9	MS130070	Spacer	2	
10	MS130110	Z Axis Rear Housing Cover	1	
11	MS130120	Shaft Cover	1	
12	MS130150	Cover	1	
13	A600001020	Coupling Ø25	1	CPT62425
14		Motor	1	1FK7063-5
15	AB256260	Ball Bearing	2	25BS62DH
16	AB306260	Ball Bearing	2	30BS62DH
17	AKP105025	Pin	2	Ø5X25L
18	AKP106025	Pin	2	Ø6X25L
19	ANN515020	Lock Nut	1	YSK-M20x1.5
20	ASM605020	Hexagon Socket Cap Hd Screw	6	M5x20L
21	ASM606020	Hexagon Socket Cap Hd Screw	2	M6x20L
22	ASM606025	Hexagon Socket Cap Hd Screw	3	M6x25L
23	ASM606045	Hexagon Socket Cap Hd Screw	3	M6x45L
24	ASM608030	Hexagon Socket Cap Hd Screw	4	M8x30L
25	ASM610025	Hexagon Socket Cap Hd Screw	1	M10x25L
26	ASM610035	Hexagon Socket Cap Hd Screw	4	M10x35L
27	ASM610045	Hexagon Socket Cap Hd Screw	6	M10x45L
28	ASM620090	Hexagon Socket Cap Hd Screw	6	M20x90L
29	AWMH01008	Washer	4	M8
30	AWMH01020	Washer	6	M20

Item No	Part Number	Description	Quantity	Remarks
31	AWMS01020	Spring Washer	6	M20

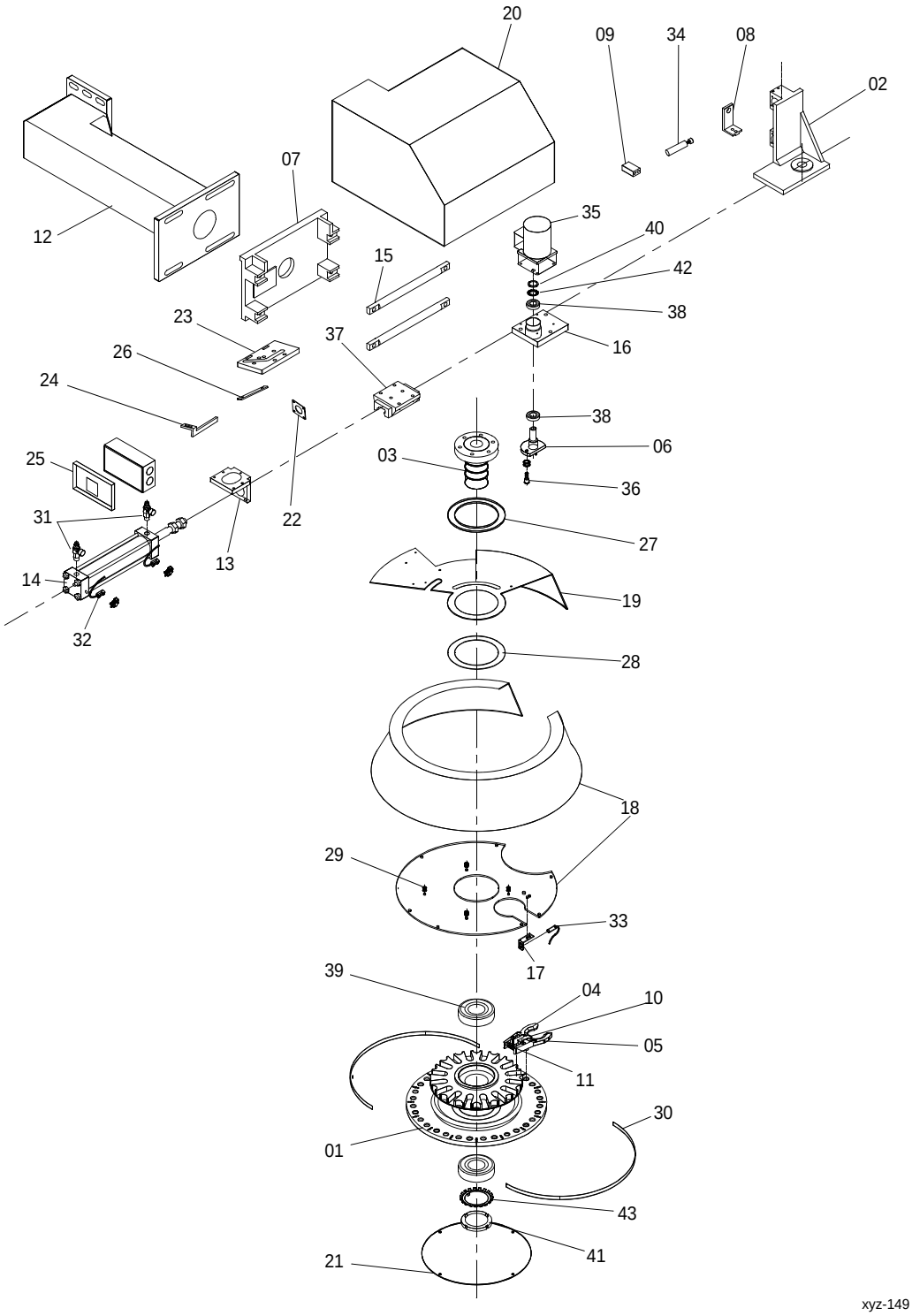


Figure 76 Magazine assembly

10.1.8 Magazine Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS520010	Tool Plate Pulley	1	
2	MS520020	Slide	1	
3	MS520030	Bracket Shaft	1	
4	MS520040	Right Clamp Finger	12	
5	MS520050	Left Clamp Finger	12	
6	MS520060	Shaft	1	
7	MS520070	Base	1	
8	MS520080	Bracket	1	
9	MS520090	Dog	1	
10	MS520100	Key	12	
11	MS520110	Spring	12	
12	MS520120	Magazine Bracket	1	
13	MS520130	Sliding Cylinder Plate	1	
14	MS520140	Sliding Cylinder	1	
15	MS520150	Guide Rail	2	
16	MS520160	Motor Bearing House	1	
17	MS520170	Switch Stand	1	
18	MS520180	Round Plate Cover	1	
19	MS520190	Automatic Cover	1	
20	MS520200	Bracket Cover	1	
21	MS520210	Magazine Bracket	1	
22	MS520220	Linear Bearing Cover	1	
23	MS520230	Curve	1	
24	MS520240	Cover	1	
25	MS520250	Wiring Case	1	
26	MS520260	Curve Washer	1	
27	MS520270	Automatic Mould Plate	1	
28	MS520280	Automatic Mould Plate	1	
29	MS520290	Automatic Use Washers	1	
30	MS520300	Dial	1	
31	A111100200	Speed Controller Plate	4	2/8”
32	A111300010	Sensor	2	LS-BD2
33	A111300020	Home Sensor	1	1DCA-0013
34	A111400010	Buffer	1	
35	A300100010	Motor	1	380Vx60Wx1/18X50HZ
36	A300100020	Bearing	1	GF-10
37	A300100030	Linear Bearing	4	LM30-Ø30xØ45x65L

Item No	Part Number	Description	Quantity	Remarks
38	AB6004	Bearing	2	6004ZZ
39	AB6006	Bearing	2	6006N
40	ANM110020	Bearing Nut	1	M20x1.0
41	ANM115030	Bearing Nut	1	M30x1.5
42	AWMF01020	Washer	1	M20
43	AWMF01030	Washer	1	M30

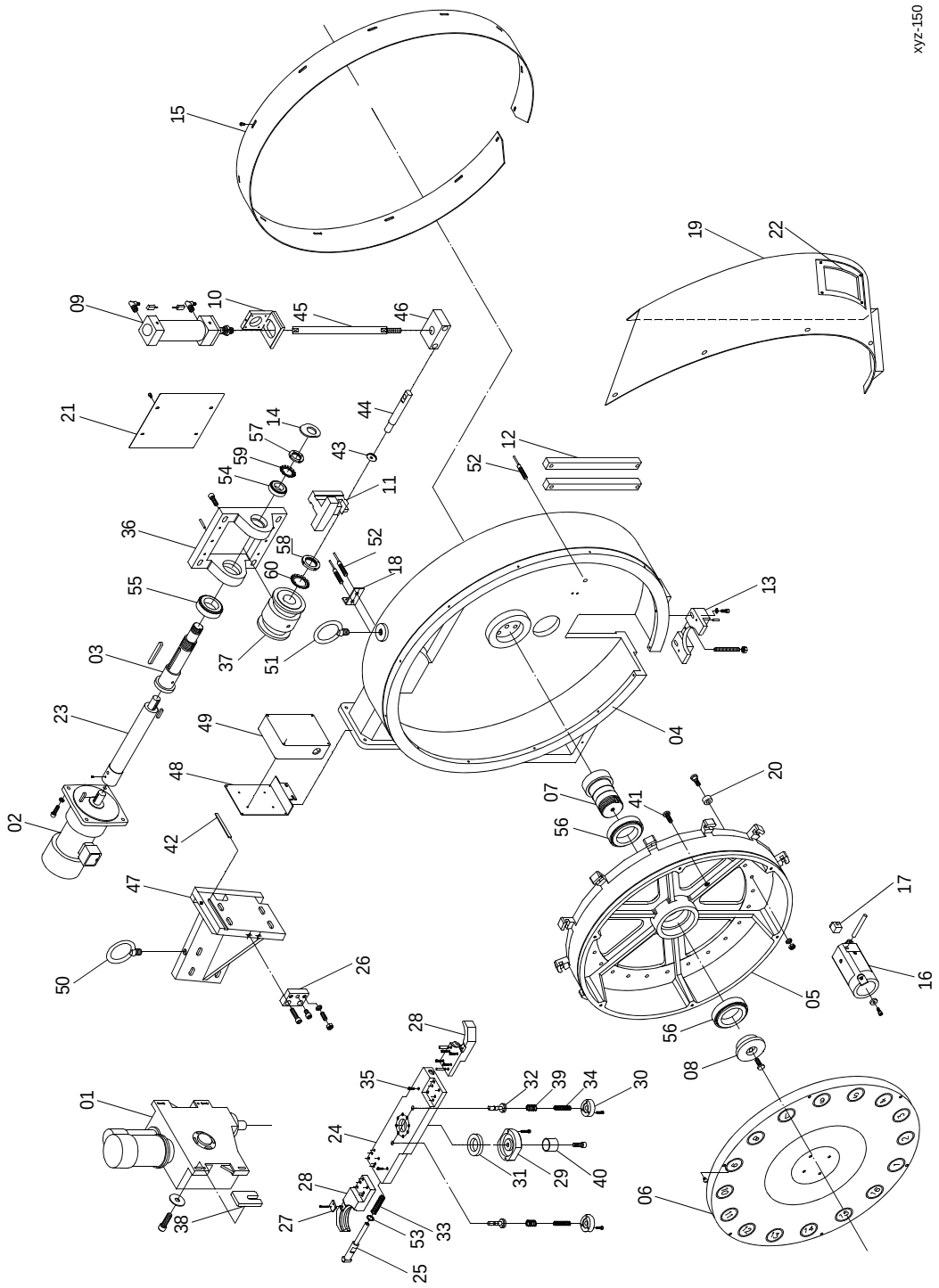


Figure 77 ATC sensor assembly

10.1.9 ATC Sensor Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS530010	ATC	1	
2	MS530020	Gear Motor	1	1/4HP-1/2-220V-380V
3	MS530030	Shaft	1	
4	MS530040	Tool Storage	1	
5	MS530050	Pushing	1	
6	MS530060	Dial	1	
7	MS530070	Pot Shaft	1	
8	MS530080	Shaft Cover	1	
9	MS530090	Air Bracket	1	
10	MS530100	Air Bracket	1	
11	MS530110	Supporting Plate	1	
12	MS530120	Connector	2	
13	MS530130	Supporting Plate Bracket	1	
14	MS530140	Sensor	2	
15	MS530150	Protector	1	
16	MS530160	Pot	16	
17	MS530170	Dog	16	
18	MS530180	Sensor Bracket	1	
19	MS530190	ATC Protector	1	
20	MS530200	Shaft	1	
21	MS530210	Cam Bracket Cover	1	
22	MS530220	ATC Protector Cover	1	
23	MS530230	Motor Shaft	1	
24	MS530240	Change Tool Arm	1	
25	MS530250	Rod	1	
26	MS530260	Adjust Dog	1	
27	MS530270	Key	2	
28	MS530280	Grappling Hook	2	
29	MS530290	Fixing Plate	1	
30	MS530300	Fixing Plate	2	
31	MS530310	Clamp Ring	2	
32	MS530320	Rod	2	
33	MS530330	Spring	2	
34	MS530340	Spring	2	
35	MS530350	Screw	2	
36	MS530360	Cam Bracket	1	
37	MS530370	Pushing Cam	1	

Item No	Part Number	Description	Quantity	Remarks
38	MS530380	Washer	1	
39	MS530390	Spring	2	
40	MS530400	Regulating Ring	1	
41	MS530410	Hone Sensor Bolt	1	
42	MS530420	Key	1	
43	MS530430	Washer	1	
44	MS530440	Link Rod	1	
45	MS530450	Connecting Rod	1	
46	MS530460	Dog	1	
47	MS530470	Connector Bracket	1	
48	MS530480	Bracket	1	
49	MS530490	Electrical Box	1	
50	A300100040	Bolt	1	M12
51	A300100050	Bolt	1	M20
52	A300100060	Sensor	3	
53	AB1820	Bearing	2	LFB1820
54	AB32005	Bearing	1	32005
55	AB32007	Bearing	1	32007
56	AB6208	Bearing	2	6208
57	ANM115025	Nut	1	M25x1.5
58	ANM115035	Nut	1	M35x1.5
59	AWMF01025	Washer	1	M25
60	AWMF01035	Washer	1	M35

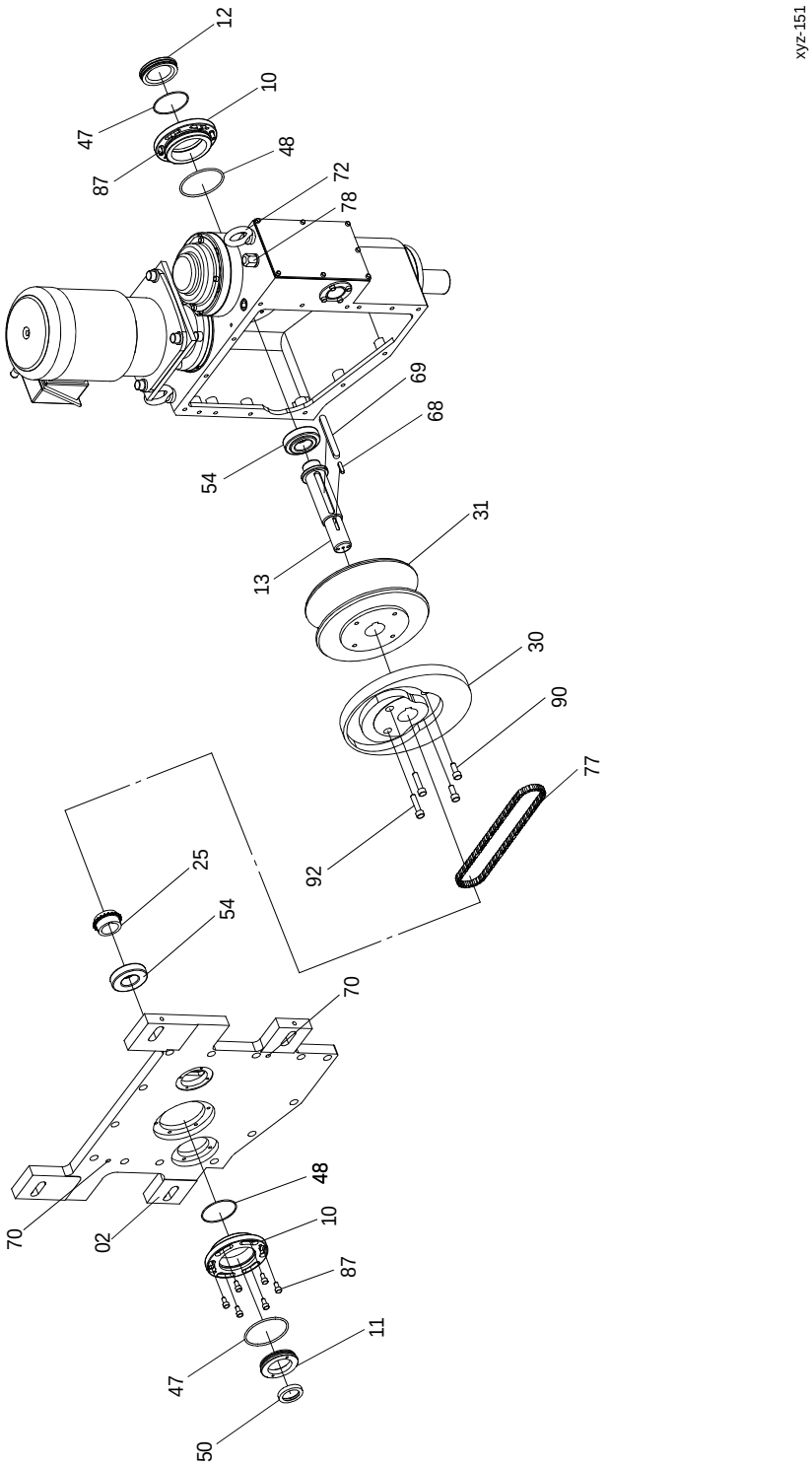


Figure 78 ATC cam box assembly

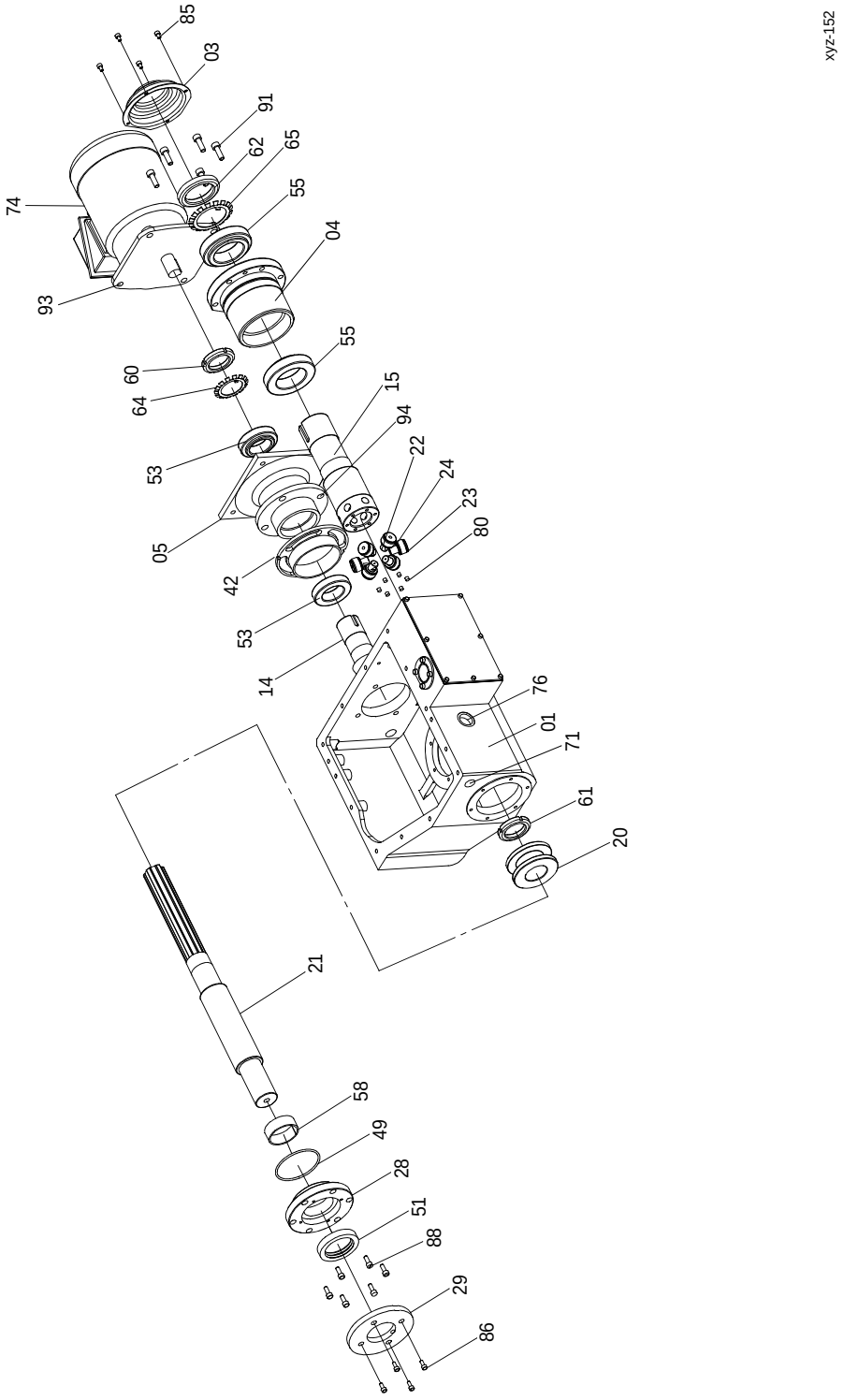


Figure 79 ATC cam box assembly

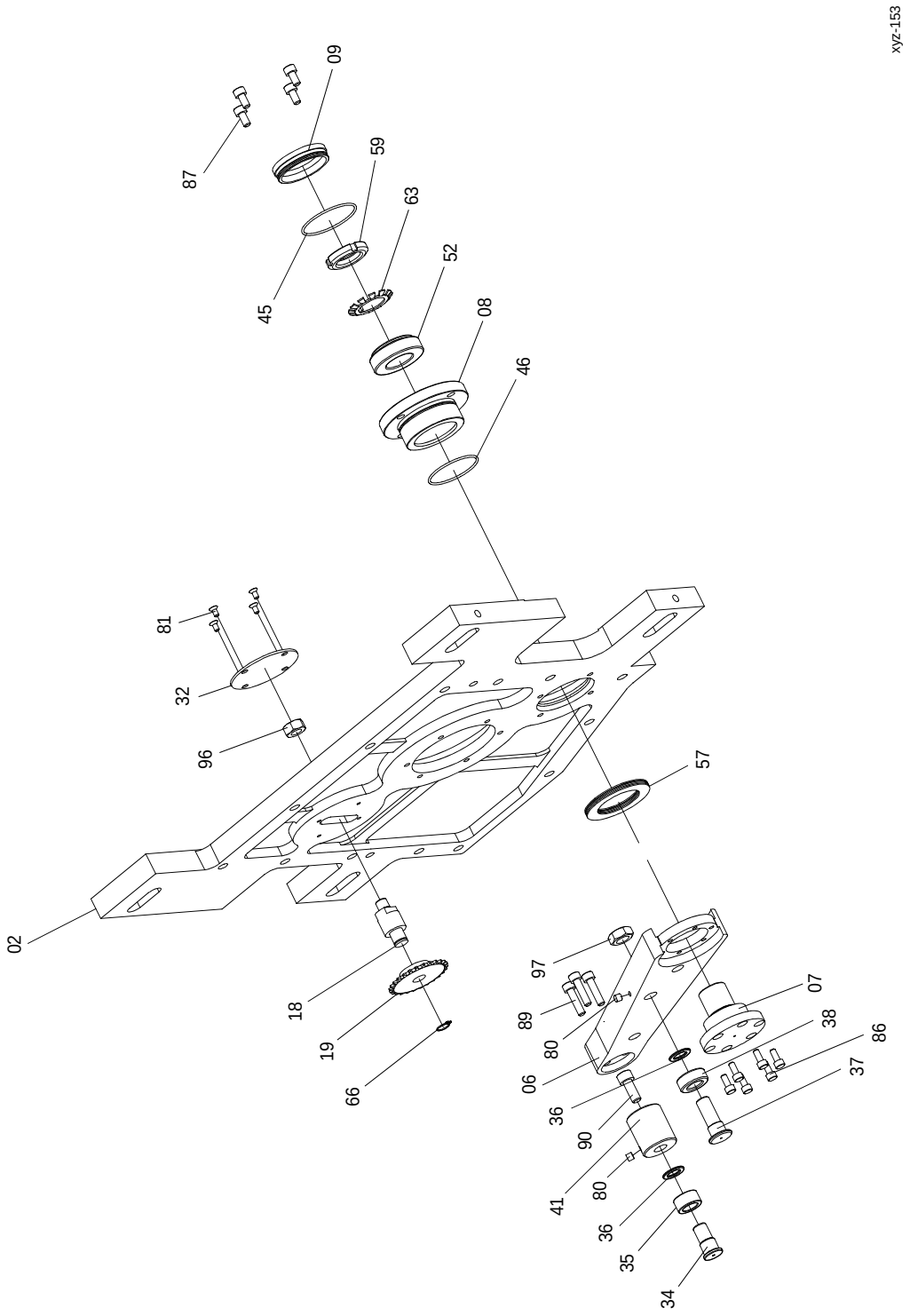


Figure 80 ATC cam box assembly

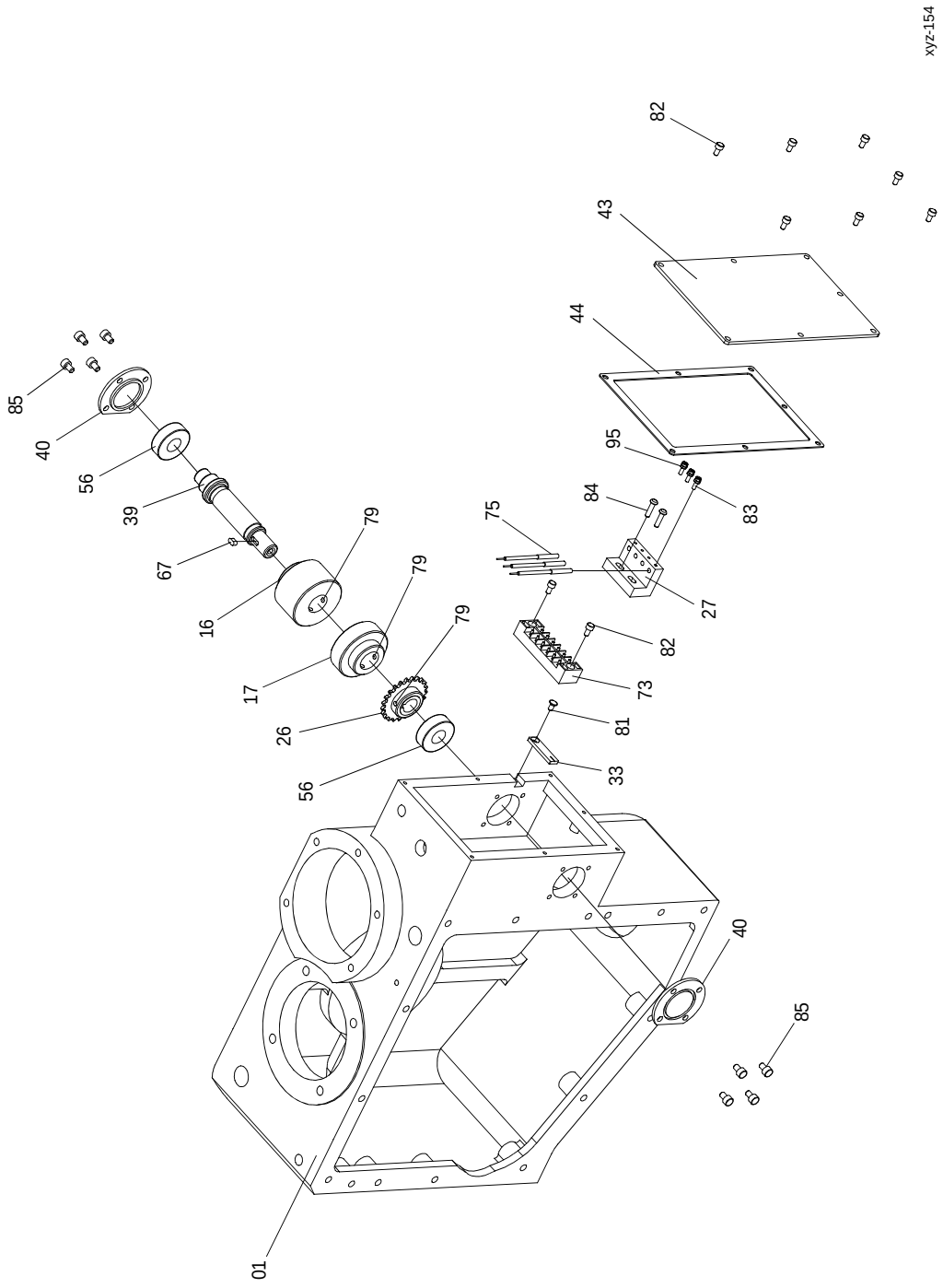


Figure 81 ATC cam box assembly

10.1.10 ATC Cam Box Assembly

Item No	Part Number	Description	Quantity	Remarks
1	A01-001	Cam Box	1	
2	A01-002	Box Cover	1	
3	A01-003	Cover	1	
4	A01-004	Bearing Bracket	1	
5	A01-005	Motor Bracket	1	
6	A01-006	Move Arm	1	
7	A01-007	Arm Shaft	1	
8	A01-008	Arm Bracket	1	
9	A01-009	Cover	1	
10	A01-010	Bearing Bracket	2	
11	A01-011	Cover	1	
12	A01-012	Cover	1	
13	A01-013	Cam Shaft	1	
14	A01-014	Driving Gear	1	
15	A01-015	Turret	1	
16	A01-016	Checking Dog	1	
17	A01-017	Braking Dog	1	
18	A01-018	Idle Wheel Shaft	1	
19	A01-019	Idle Wheel	1	
20	A01-020	Fork	1	
21	A01-021	Spline Shaft	1	
22	A01-022	Bearing	6	
23	A01-122	Ring	6	
24	A01-222	Washer	6	
25	A01-023	Chain Wheel	1	
26	A01-024	Chain Wheel	1	
27	A01-025	Proximity Switch Holder	1	
28	A01-026	Shaft Bracket	1	
29	A01-027	Flange	1	
30	A01-028	Plate Cam	1	
31	A01-029	Roller Gear Cam	1	
32	A01-031	Cover	1	
33	A01-032	Position Indicator	1	
34	A01-033	Bearing	1	
35	A01-133	Ring	1	
36	A01-233	Washer	2	
37	A01-034	Bearing	1	

Item No	Part Number	Description	Quantity	Remarks
38	A01-134	Ring	1	
39	A01-035	Dog Shaft	1	
40	A01-036	Cover	2	
41	A01-037	Needle Bearing Holder	1	
42	A01-038	Adjusting Ring	1	
43	A01-040	Cover	1	
44	A01-052	Rubber Seal	1	
45		O Ring	1	AS031
46		O Ring	1	AS033
47		O Ring	2	AS035
48		O Ring	2	G75
49		O Ring	1	G80
50		Oil Seal	1	TC 30427
51		Oil Seal	1	TB4 507212
52		Roller Bearing	1	32005
53		Roller Bearing	1	32008
54		Roller Bearing	2	30206
55		Roller Bearing	2	32011
56		Ball Bearing	2	6202ZZ
57		Thrust Bearing	1	NTB40603
58		Bearing	1	LBB5020
59		Locking Nut	1	AN05
60		Locking Nut	1	AN08
61		Locking Nut	1	AN08(with set screws)
62		Locking Nut	2	AN11
63		Washer	1	AW05
64		Washer	1	AW08
65		Washer	1	AW11
66		C Ring	1	S12
67		Key	1	4x8x4mm
68		Key	1	5x20x5mm
69		Key	1	10x85x8mm
70		Taper Pins	2	#6x38L
71		Oil Plug	2	1/2” 10L
72		Hook Ring	2	M12
73		Terminal Block	1	6P
74		Motor	1	3/4HP
75		Sensor	3	E2E-CR8B1

Item No	Part Number	Description	Quantity	Remarks
76		Oil Gauge	1	
77		Chain	1	RS25x597L(94)
78		Cable Gland	1	M16x1.5
79		Set Screw	5	M5x6
80		Set Screw	14	M6x5
81		Screw	5	M4x6
82		Screw	9	M4x8
83		Screw	4	M3x10
84		Screw	2	M4x16
85		Screw	12	M5x8
86		Screw	10	M5x12
87		Screw	16	M6x12
88		Screw	6	M6x16
89		Screw	3	M6x25
90		Screw	3	M8x20
91		Screw	18	M8x25
92		Screw	2	M8x35
93		Screw	4	M10x25
94		Screw	4	M10x30
95		Nut	4	M3xP0.5
96		Nut	1	M10xP1.25
97		Nut	1	M12xP1.5

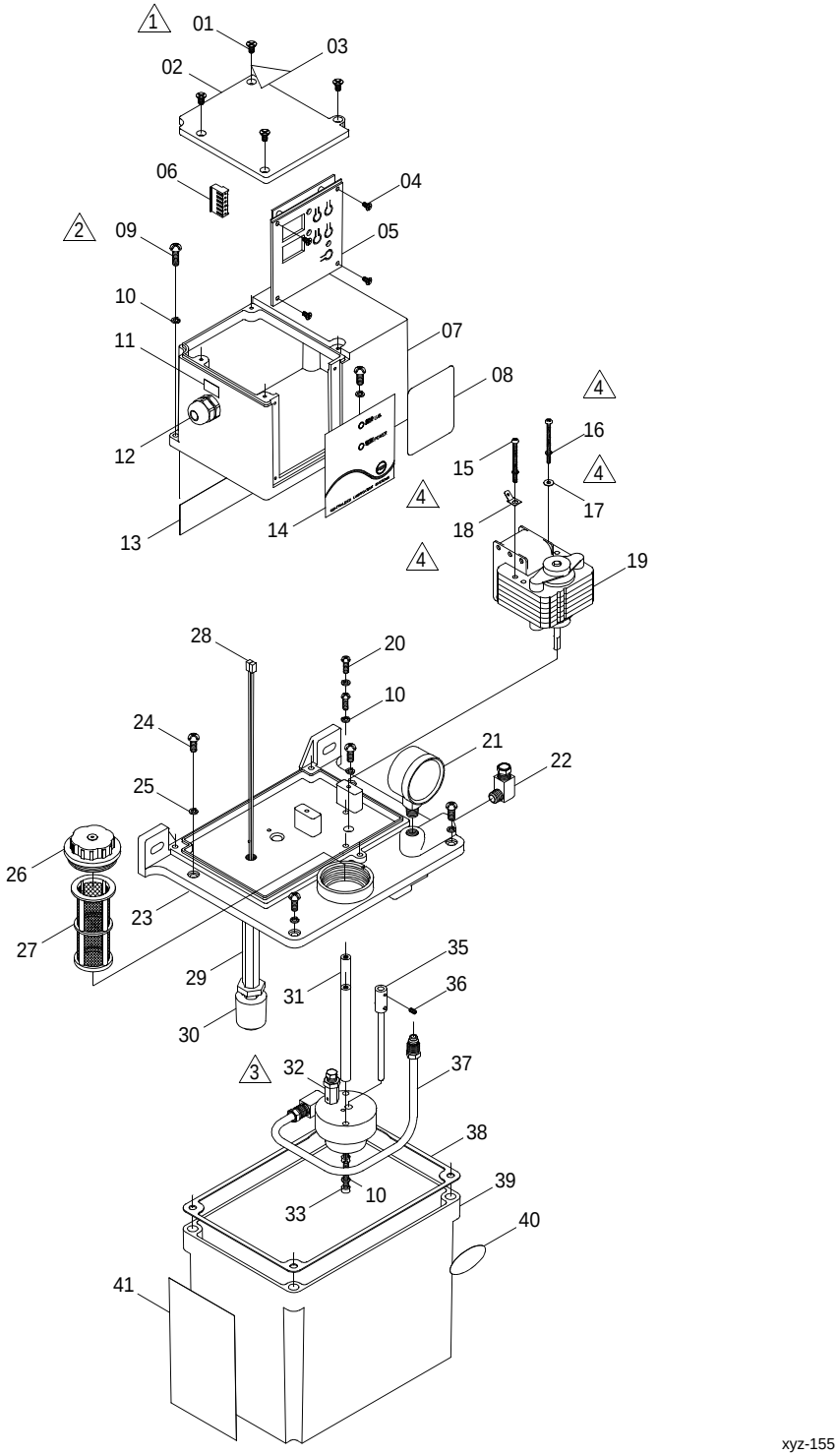


Figure 82 Lubricator assembly

10.1.11 Lubricator Assembly

Item No	Part Number	Description	Quantity	Remarks
1	136007	Cross Recess Head Screw	4	M4x12L
2	155023-MA	Top Cover	1	YET-3.1
3	190104	Sticker	1	
4	136006	Self Tapping Screw	4	M3x6L
5	300031	IC Board	1	YET-C 110V/220V
6	341204	Terminal Bond	1	VH-6P
7	155026-SE	Oil Box (Top)	1	Ø16.without Bu
8	190114	Sticker (CE)	1	YET-C1
9	130348	Button Head Cap Screw	3	M4x15L
10	124603	Spring Washer	7	Ø4
11	190004A	Sticker (110V)	1	110V
	190004B	Sticker (120V)	1	220V
12	340600	Super Gland	1	Ø16(Ø9)
13	190101	Sticker	1	8P
14	190107	Panel Sticker	1	YET-C
15	130347	Button Head Cap Screw	2	M4x50L
16	124603	Spring Washer	2	Ø4
17	124202	Washer	1	
18	340013	PC Board Terminal	1	4.75x0.5t(Ø4.3)
19	400100	Lubrication Motor	1	30t.110V
20	130317	Button Head Cap Screw	2	M4x30L
21	327200	Pressure Gauge	1	15kgxPT1/8x1.5”
22	PH-0401-A-SE	Elbow Adapter	1	Ø4x1/8
23	151033-SE	Top Cover (YET-3L)	1	
24	130321	Button Head Cap Screw	4	M5x12L
25	124601	Spring Washer	4	3/16
26	152001	Cap (Yellow)	1	
27	153000	Oil Filter	1	YAE 40
28	340007-000	Terminal Post	2	JST3.96(VH)
29	YES027	Straight Adapter	1	95mm(2L)
30	321002	Adapter Switch	1	
31	YES041	Branch Pipe	2	
32	401004	Gear Pump	1	
33	132017	Hexagon Socket Cap Hd Screw	2	M4x25L
34				
35	200027	Transmission Shaft	1	YET

Item No	Part Number	Description	Quantity	Remarks
36	133004	Socket Headless Set Screw	1	M3x6L
37	YET020	Aluminium Pipe	1	Ø6x270mm
38	170001	Oil Seal	1	3L
39	162002-SE	Oil Box	1	3L
40	190103	Sticker (ISO-9002)	1	
41	190141	Sticker (Operation Note)	1	YET-C1P2/C2P2

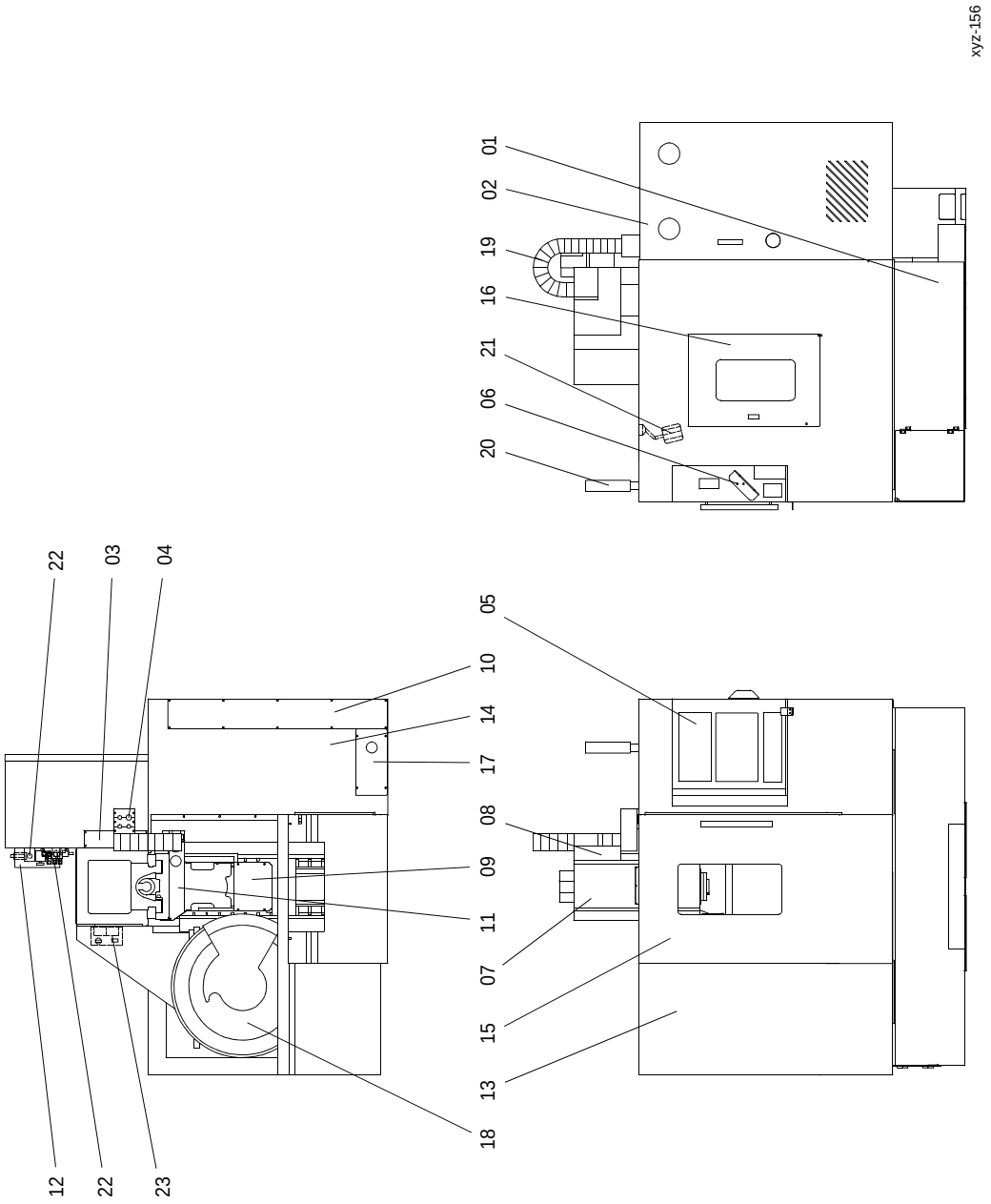


Figure 83 Guard assembly

10.1.12 Guard Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS360051	Rear Cover	1	
2	MS410010	Electrical Cabinet	1	2.3m/m
3	MS410010-C	Electrical Cabinet	1	2.3m/m
4	MS410010-E	Cover	1	2.3m/m
5	MS41003B	Control Box	1	2.3m/m
6	MS410083	Electrical Handwheel Bracket	1	2.3m/m
7	MS420021	Guard	1	2.3m/m
8	MS420031	Guard	1	2.3m/m
9	MS420041	Cover	1	2.3m/m
10	MS420081	Cover	1	2.3m/m
11	MS420121	Bracket	1	2.3m/m
12	MS430053	Cover	1	2.3m/m
13	MS430192	Left Guard	1	2.3m/m
14	MS430203	Right Guard	1	2.3m/m
15	MS430212	Right Sliding Door	1	2.3m/m
16	MS430241	Left Side Door	1	2.3m/m
17	MS430251	Cover	1	2.3m/m
18		Tool Carousel	1	
19		Flexible Cable Carrier	1	
20		Lamp	1	
21		Work Light	1	
22		Air Regulator Unit	1	
23		Oil Box	1	

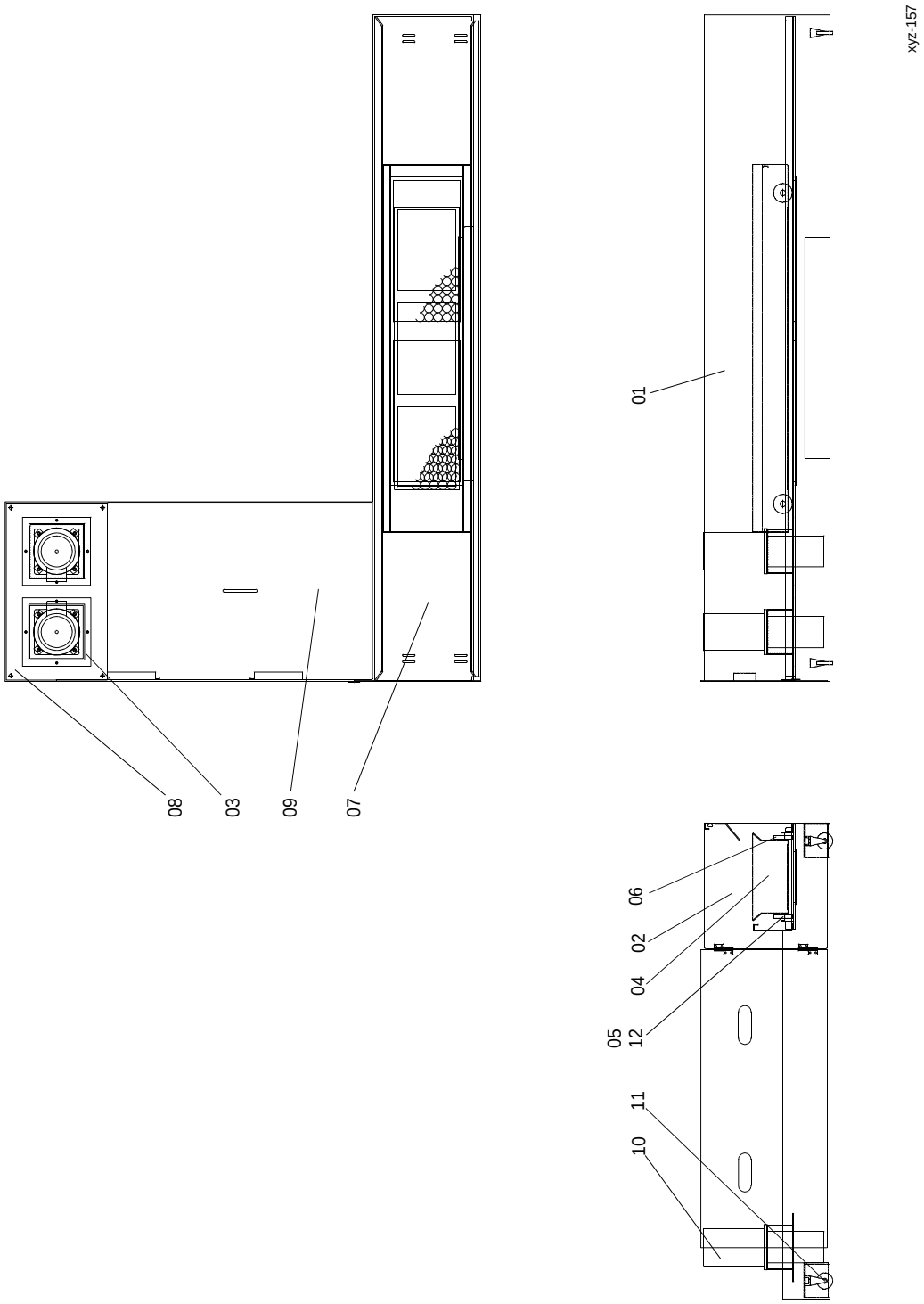


Figure 84 Coolant tank

10.1.13 Coolant Tank

Item No	Part Number	Description	Quantity	Remarks
1	MS360022	Coolant Tank	1	2.0m/m
2	MS360022-A	Side Cover	1	2.3m/m
3	MS360034	Coolant Pump	2	2.3m/m
4	MS360042	Chip Car	1	2.3m/m
5	MS360042-A	Shaft	4	S45C
6	MS360051	Roller	4	S45C
7	MS360082	Coolant Tank Cover	1	2.3m/m
8	MS360131	Coolant Tank Cover	1	2.3m/m
9	MS360140	Coolant Tank Cover	1	2.3m/m
10	MS720031	Coolant Pump	2	
11		Wheel	5	
12		Ring	4	

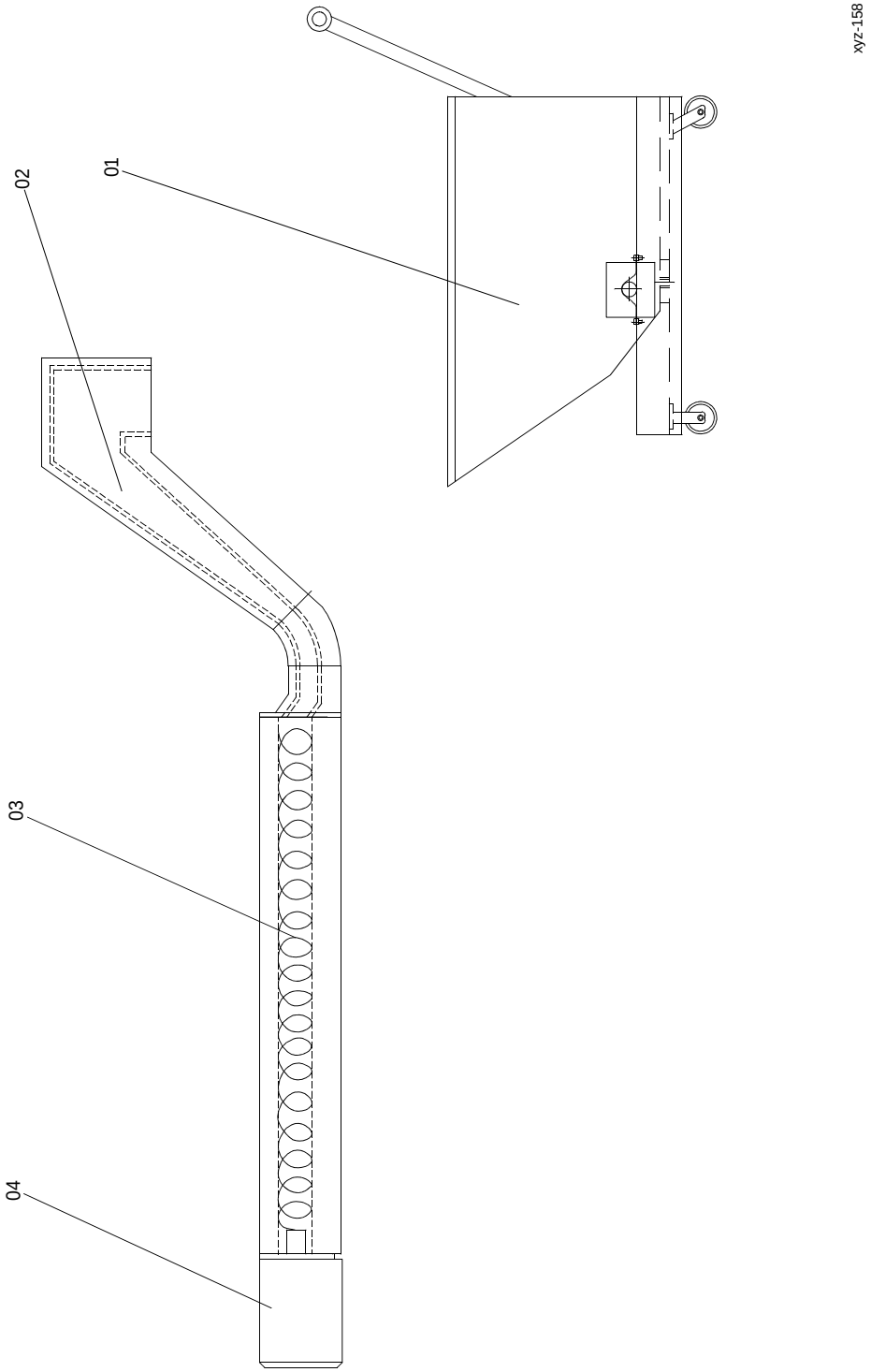


Figure 85 Chip conveyor

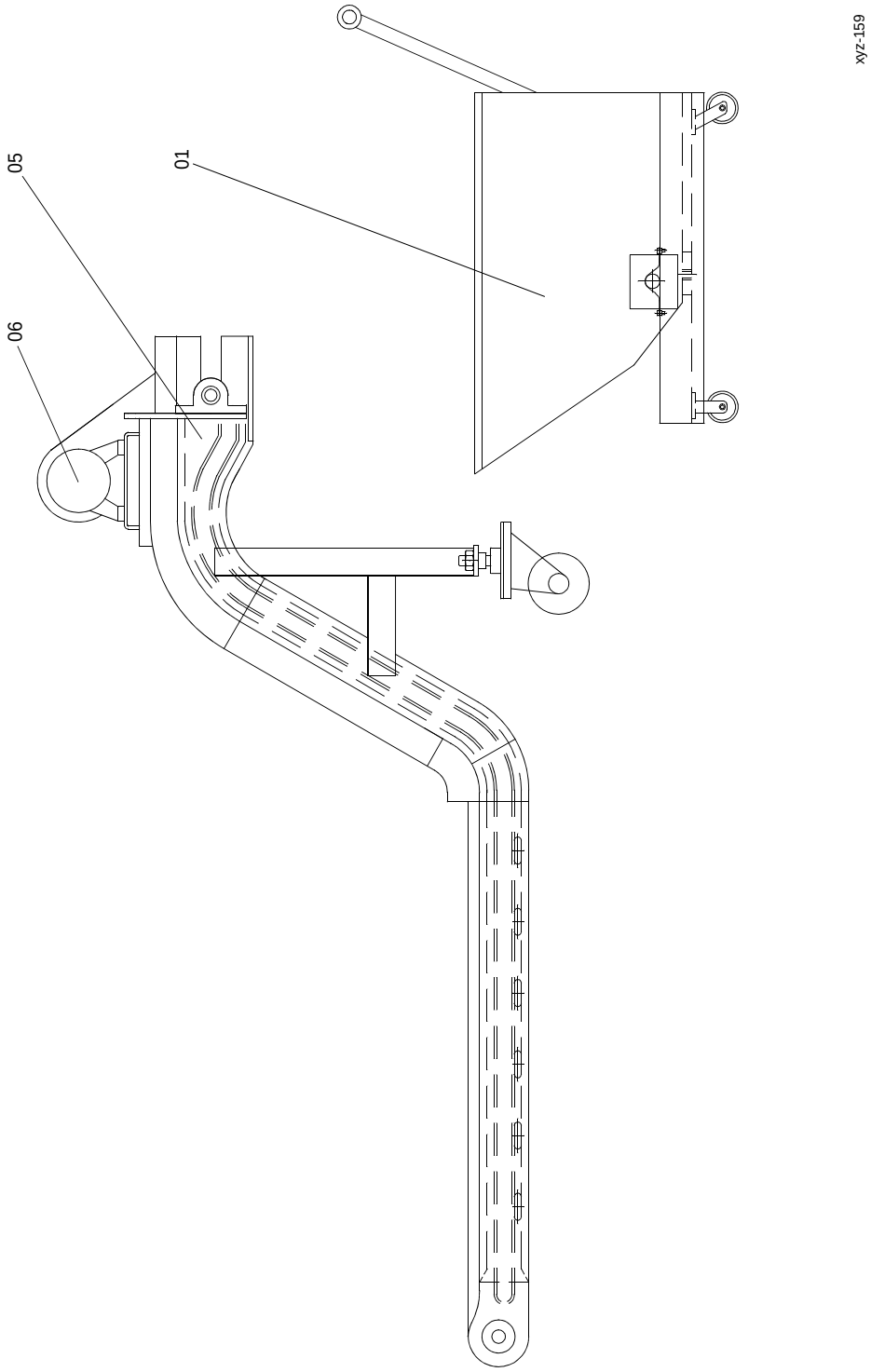


Figure 86 Swarf conveyor

10.1.14 Chip and Swarf Conveyors

Item No	Part Number	Description	Quantity	Remarks
1	MS450011	Chip Car	1	
2	MS460011	Screw Type Auger	1	
3	MS460021	Screw	1	
4	MS460031	Motor	1	
5	MS460111	Swarf Conveyor	1	
6	MS460121	Motor	1	

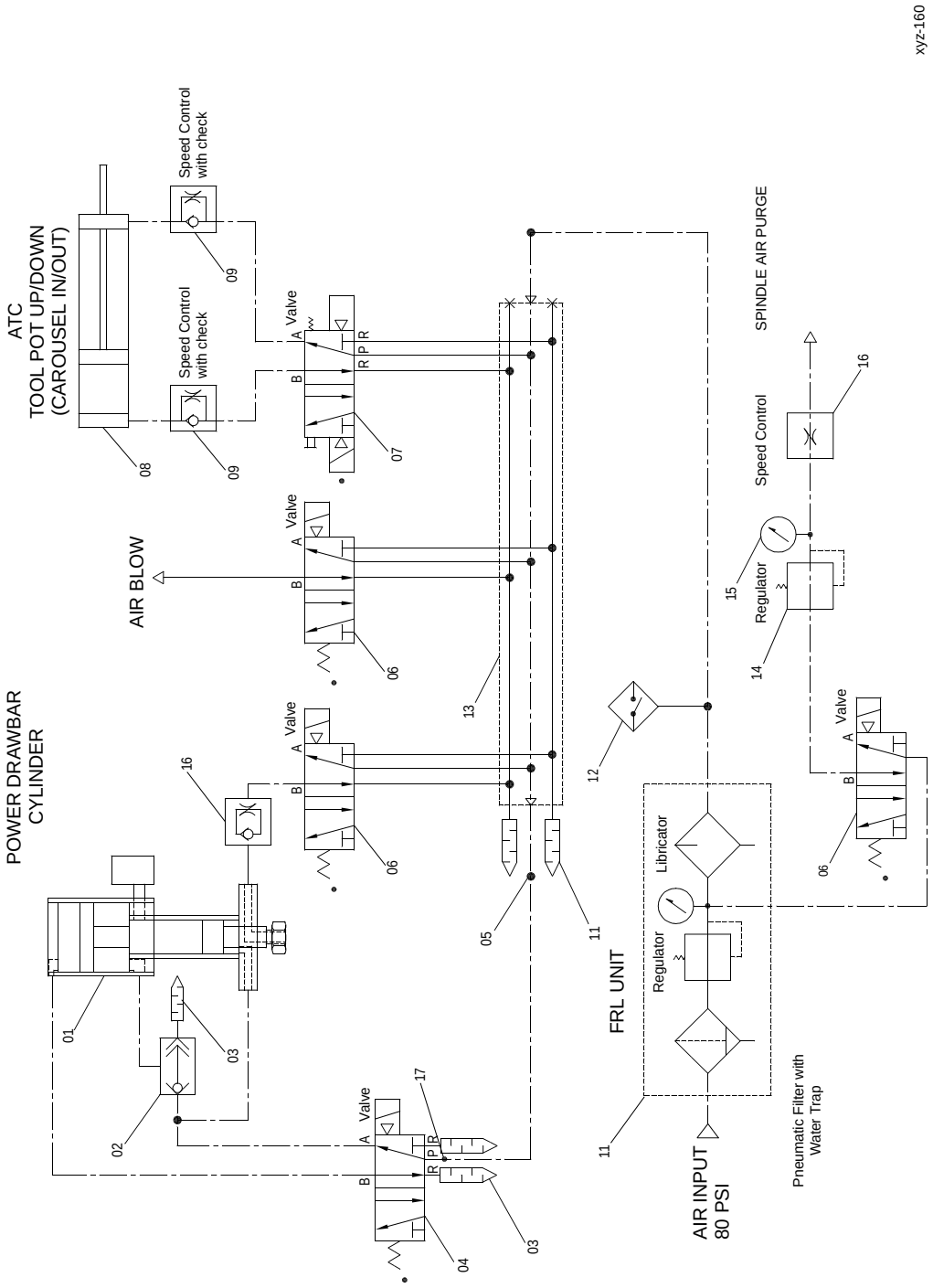


Figure 87 Pneumatic assembly

10.1.15 Pneumatic Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS010300	Air Unclamping Cylinder	1	
2	A110500010	Quick Exhaust Valve	1	QE-03
3	A111200010	Muffler	3	SLT-03
4	A110100011	Solenoid Valve	1	MVSC-300-4E1
5	A111000010	Solenoid Coil 24VDC 3W SHAKO	1	UFR/L02,03
6	A110100010	Solenoid Valve SHAKO PU322-02S	2	PU322-02S
7	A110100020	Solenoid Valve SHAKO PU520-029D	1	PU520-029D DC24V
8	MS530090	ARM Type ATC-Pot UP/DOWN Cylinder	1	
9	MS520390	Carousel Type ATC-IN/OUT Cylinder	1	
10	A111200020	Muffler	2	CSL-02 1/4
11	A110200010	FRL Unit SHAKO UFR/L-03	1	UFR/L-03
12	A110600010	Pressure Switch SAGINOMIYA SNS-110Q020	1	SNS-C110Q020
13	A110100030	Solenoid Manifold	1	MVSA-260-5B3
14	A110800010	Air Regulator	1	MAF300-8A
15	A110300010	Gage	3	PT1/4 0~10kg
16	A110400010	Speed Control	1	
17	A111100100	Joint 90°	1	PT3/8”

10.2 Rotary Type Tool Changer Parts List

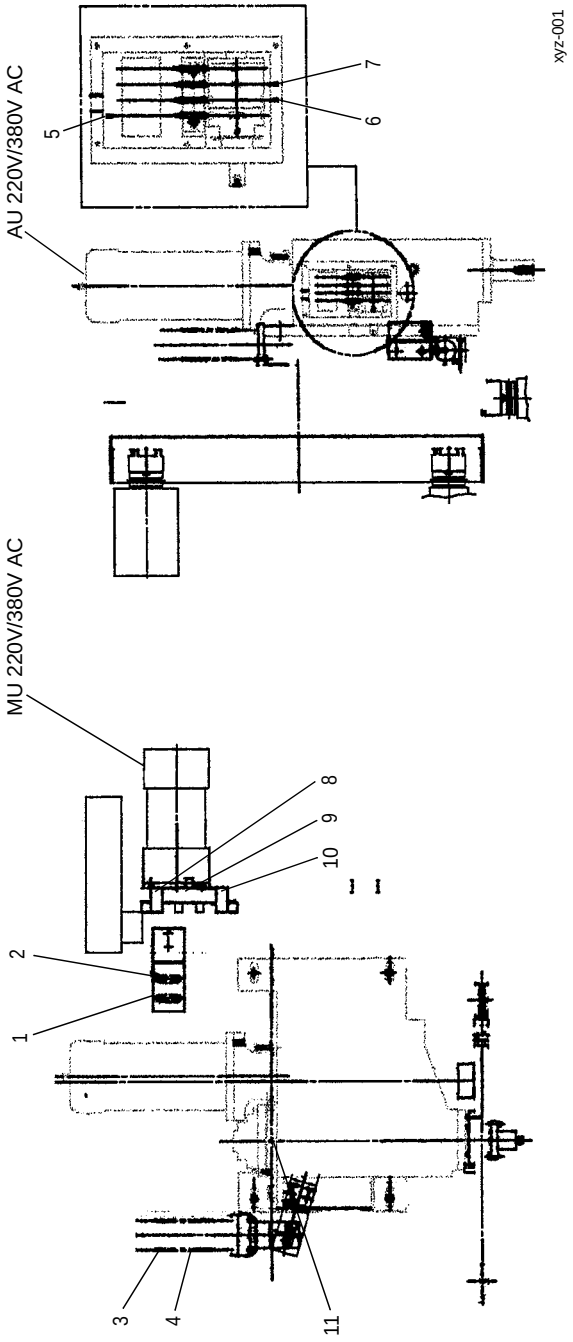


Figure 88 Tool magazine transmission

10.2.1 Tool Magazine Transmission

Item No	Part Number	Description	Quantity	Remarks
MU		Indexing Motor Mechanism	1	1/4 HP 220 V/380 V 1:20 0.2 KW
AU		Tool Change Motor Mechanism	1	1/2 HP 220 V/380 V 1:10 0.37 KW
1	TS12-02P-1	Sensor Switch 1	1	Counting signal of tool mechanism
2	TS12-02P-1	Sensor Switch 2	1	Positioning signal of tool mechanism
3	SC-100	Reaction Switch 1	1	Pocket Down Pos L.S.
4	SC-100	Reaction Switch 2	1	Pocket Up Pos L.S.
5	E2E-CR8B1	Sensor Switch 3	1	Motor stopping signal of tool mechanism
6	E2E-CR8B1	Sensor Switch 4	1	Tool change mechanism's tool clamping confirmation signal
7	E2E-CR8B1	Sensor Switch 5	1	Origin confirmation signal of tool change mechanism
8	MVSC2204E2A1	Solenoid Valve 1	1	
9		COM	1	Solenoid valve common point
10	MVSC2204E2A1	Solenoid Valve 2	1	
11	TS12-02P-1	Sensor Switch 6	1	Tool magazine origin

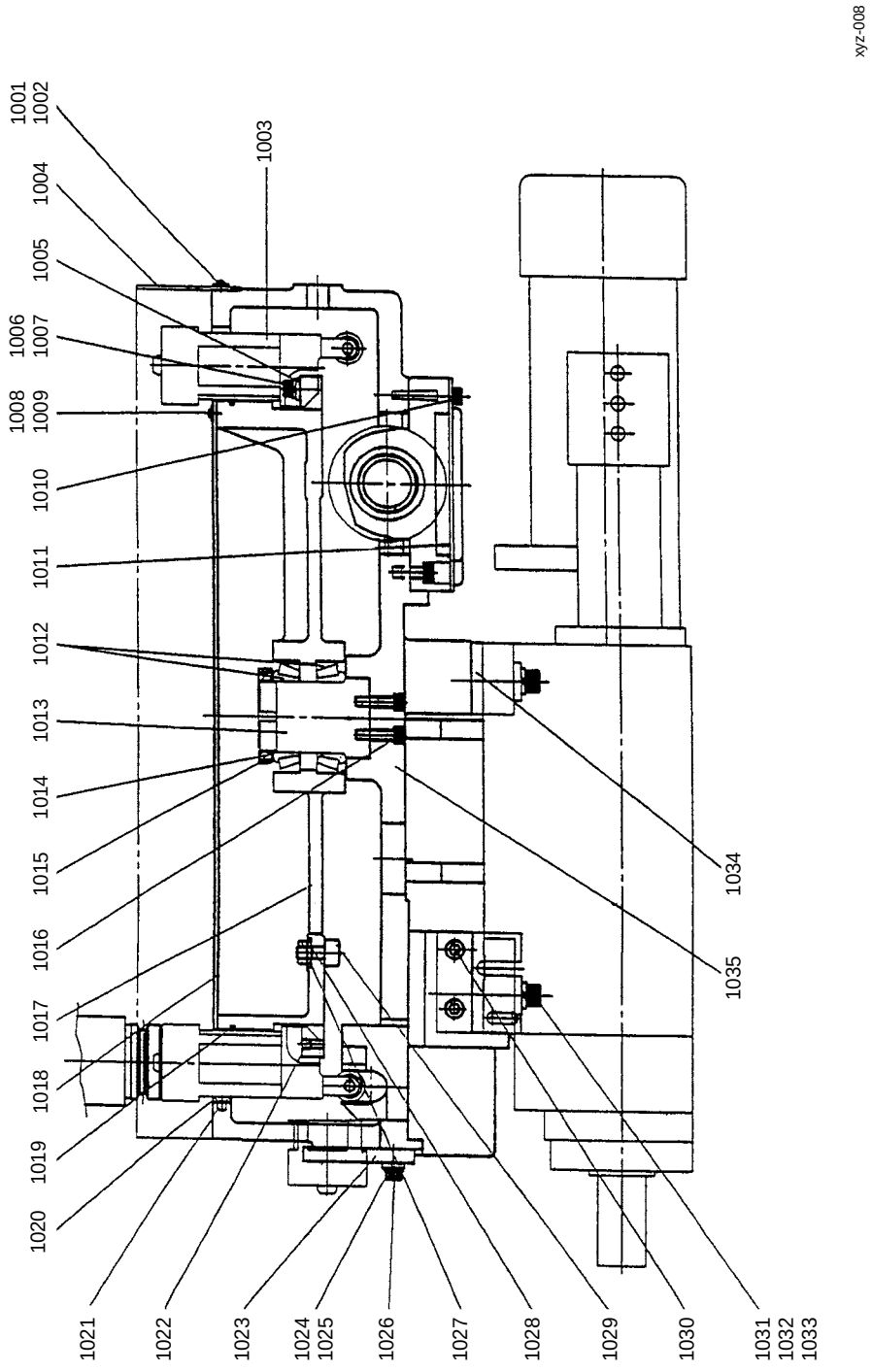


Figure 89 Driving sprocket assembly

10.2.2 Driving Sprocket Assembly

Item No	Part Number	Description	Quantity	Remarks
1001		Round Hexagon Socket Hd Cap Screw	9	M6x10L
1002		Washer	9	M6
1003		Pocket	24	
1004		Protector	1	
1005		Washer	24	SS41
1006		Hexagon Socket Hd Cap Screw	24	M8x20L
1007		Spring Washer	24	M8
1008		Round Hexagon Socket Hd Cap Screw	6	M6x20L
1009		Washer	6	
1010		Hexagon Socket Hd Cap Screw	4	M6x10L
1011		Protector	1	
1012		Taper Roller Bearings	2	32012A
1013		Shaft	1	S45C
1014		Lock Washer	1	AW12
1015		Lock Nut	1	AN12
1016		Hexagon Socket Hd Cap Screw	2	M8x35L
1017		Rotary Disk	1	FC25
1018		Pushing Cap	1	
1019		Rubber Strip	1	Ø4x1680L
1020		Pushing Collar	1	
1021		Hexagon Socket Hd Cap Screw	9	M6x12L
1022		Pocket Shaft	24	
1023		Support Plate Bracket	1	SS41
1024		Hexagon Socket Hd Cap Screw	2	M8x30L
1025		Spring Washer	2	M8
1026		Washer	2	SS41
1027		Hexagon Nut	24	M12
1028		Spring Washer	24	M12
1029		Shaft	24	S45C
1030		Hexagon Socket Hd Cap Screw	2	M10x40L
1031		Hexagon Socket Hd Cap Screw	4	M12x65L
1032		Spring Washer	4	M12
1033		Washer	4	M12
1034		ATC Pad	4	SS41

Item No	Part Number	Description	Quantity	Remarks
1035		Tool Storage	1	FC25

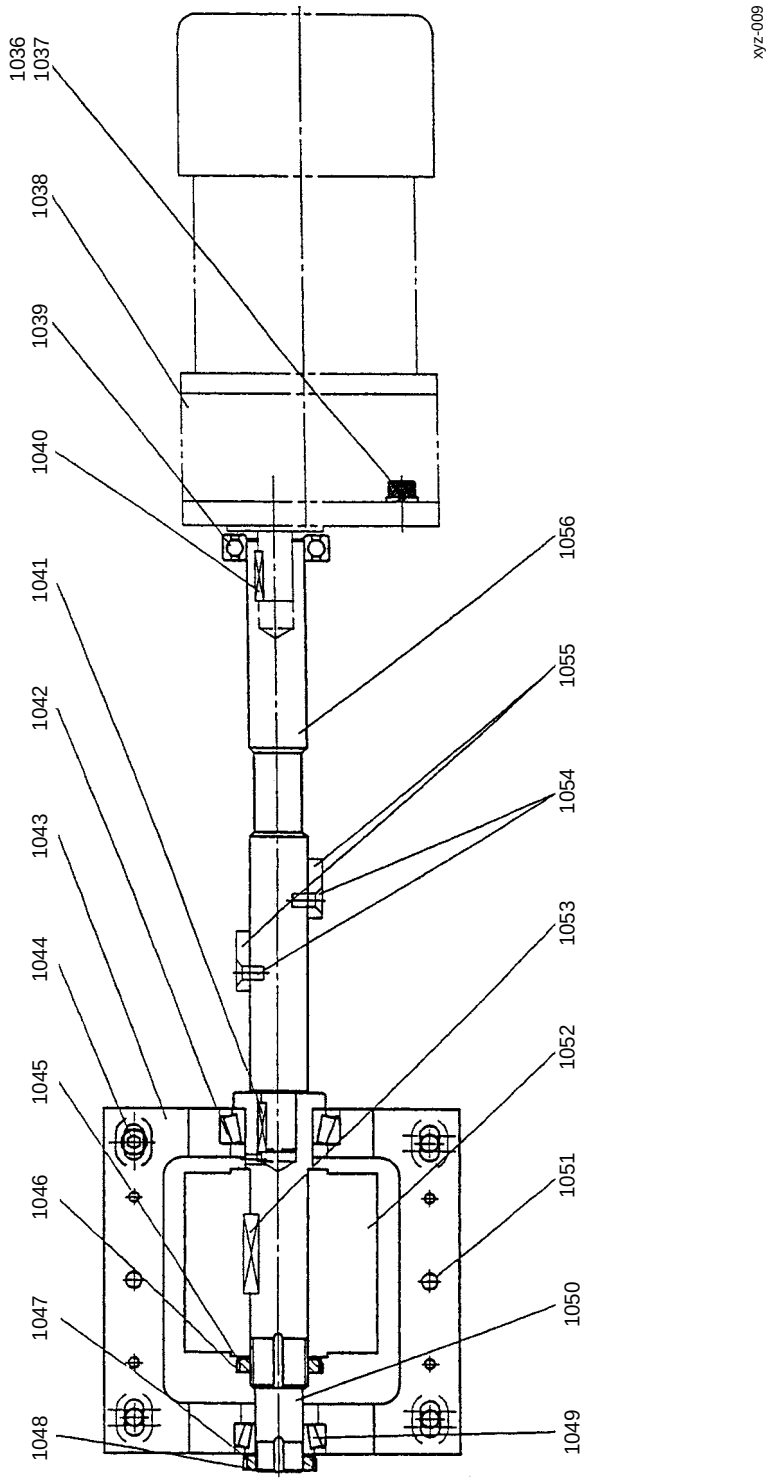


Figure 90 Motor transmission assembly

10.2.3 Motor Transmission Assembly

Item No	Part Number	Description	Quantity	Remarks
1036		Hexagon Socket Hd Cap Screw	4	M8x25L
1037		Spring Washer	4	M8
1038		Gear Motor	1	FME18 1/4 HP 1:20 380 V
1039		Ball Bearing	1	6006 ZZ
1040		Key	1	5x5x25L
1041		Key	1	5x5x25L
1042		Taper Roller Bearings	1	32007A
1043		Bearing Bracket	1	FC25
1044		Hexagon Socket Hd Set Screw	4	M8x25L
1045		Lock Washer	1	AW06
1046		Lock Nut	1	AN06
1047		Lock Washer	1	AW05
1048		Lock Nut	1	AN05
1049		Taper Roller Bearings	1	32005A
1050		Shaft	1	S45C
1051		Taper Pin	2	6x38L
1052		Tube Cam	1	SCM4
1053		Key	1	10x8x40L
1054		Hexagon Socket Hd Cap Screw	2	M6x12L
1055		Sensor	2	SS41
1056		Motor Shaft	1	S45C

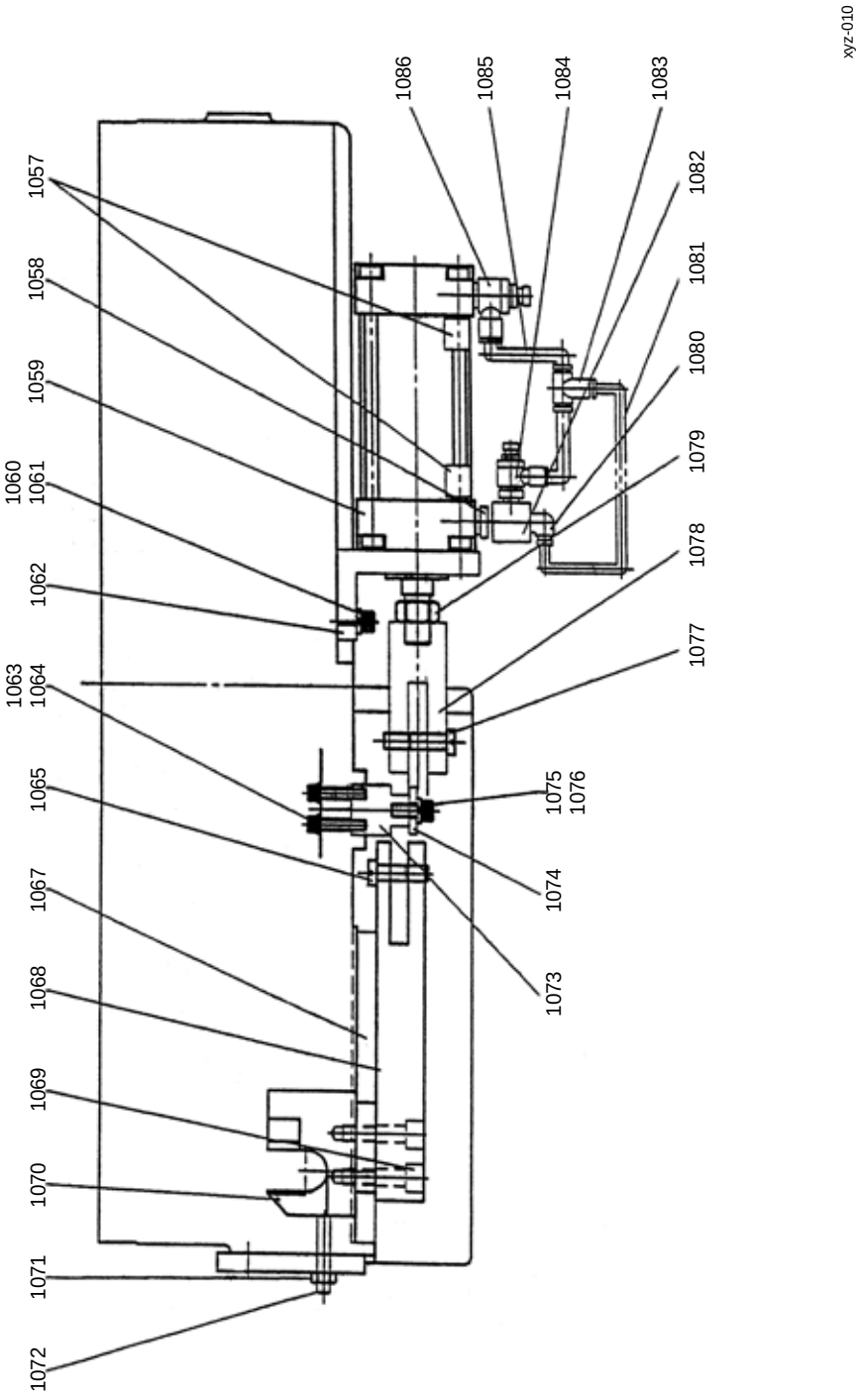


Figure 91 Tool falling cylinder assembly

10.2.4 Tool Falling Cylinder Assembly

Item No	Part Number	Description	Quantity	Remarks
1057		Magnetic Switch	2	FC-12M FC-B8
1058		Bush	1	SPC803
1059		Air Bracket	1	Ø63x85SA Type
1060		Hexagon Socket Hd Cap Screw	2	M8x25L
1061		Spring Washer	2	M8
1062		Air Bracket	1	SS41
1063		Hexagon Socket Hd Cap Screw	2	M6x30L
1064		Spring Washer	2	M6
1065		Shaft	1	S45C
1067		Connector	1	S45C
1068		Connector	1	S45C
1069		Hexagon Socket Hd Cap Screw	2	M10x35L
1070		Support Plate	1	S45C
1071		Hexagon Nut	1	M8
1072		Hexagon Socket Hd Set Screw	1	M8x50L
1073		Support Bracket	1	S45C
1074		Washer	1	SS41
1075		Hexagon Socket Hd Cap Screw	1	M8x20L
1076		Spring Washer	1	
1077		Shaft	1	S45C
1078		Connector	1	S45C
1079		Hexagon Nut	1	M16P105
1080		Joint	1	SPL-6M5
1081		Pu Tube	1	Ø6x40L
1082		Valve	1	PC02
1083		T Type Joint	1	SPE 8x6x8
1084		Adjustable Joint	1	JSC-802
1085		Pu Tube	1	
1086		Adjustable Joint	1	JSC-803

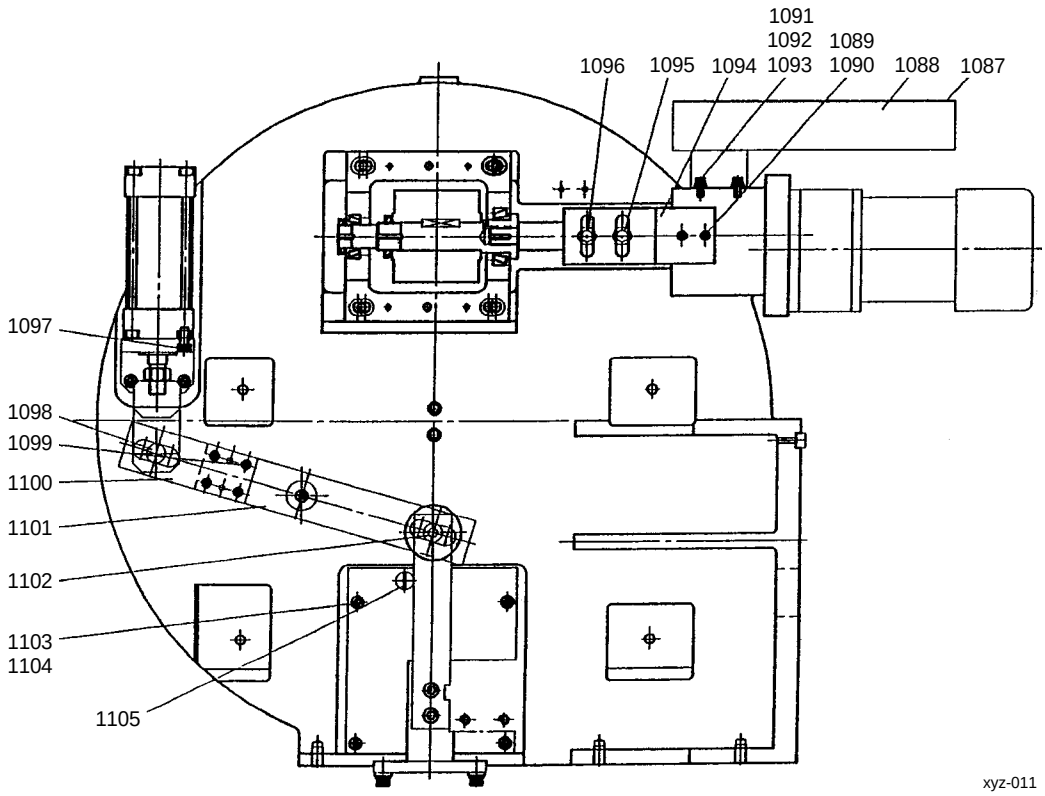


Figure 92 Tool falling guide plate cylinder assembly

10.2.5 Tool Falling Guide Plate Cylinder Assembly

Item No	Part Number	Description	Quantity	Remarks
1087		Pushing Cap	1	SPHC
1088		Box	1	SPHC
1089		Hexagon Socket Hd Cap Screw	2	M6x16L
1091		Hexagon Socket Hd Cap Screw	2	M6x16L
1092		Spring Washer	2	M6
1093		Washer	2	M6
1094		Sensor Bracket	1	SPHC
1095		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO
1096		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO
1097		Hexagon Socket Hd Cap Screw	4	M8x20L
1098		Wheel	1	S45C
1099		Hexagon Socket Hd Cap Screw	4	M6x16L
1100		Connector	1	S45C
1101		Arm	1	S45C
1102		Wheel	1	S45C
1103		Hexagon Socket Hd Cap Screw	4	M8x25L
1104		Spring Washer	4	M8
1105		Shaft	1	S45C

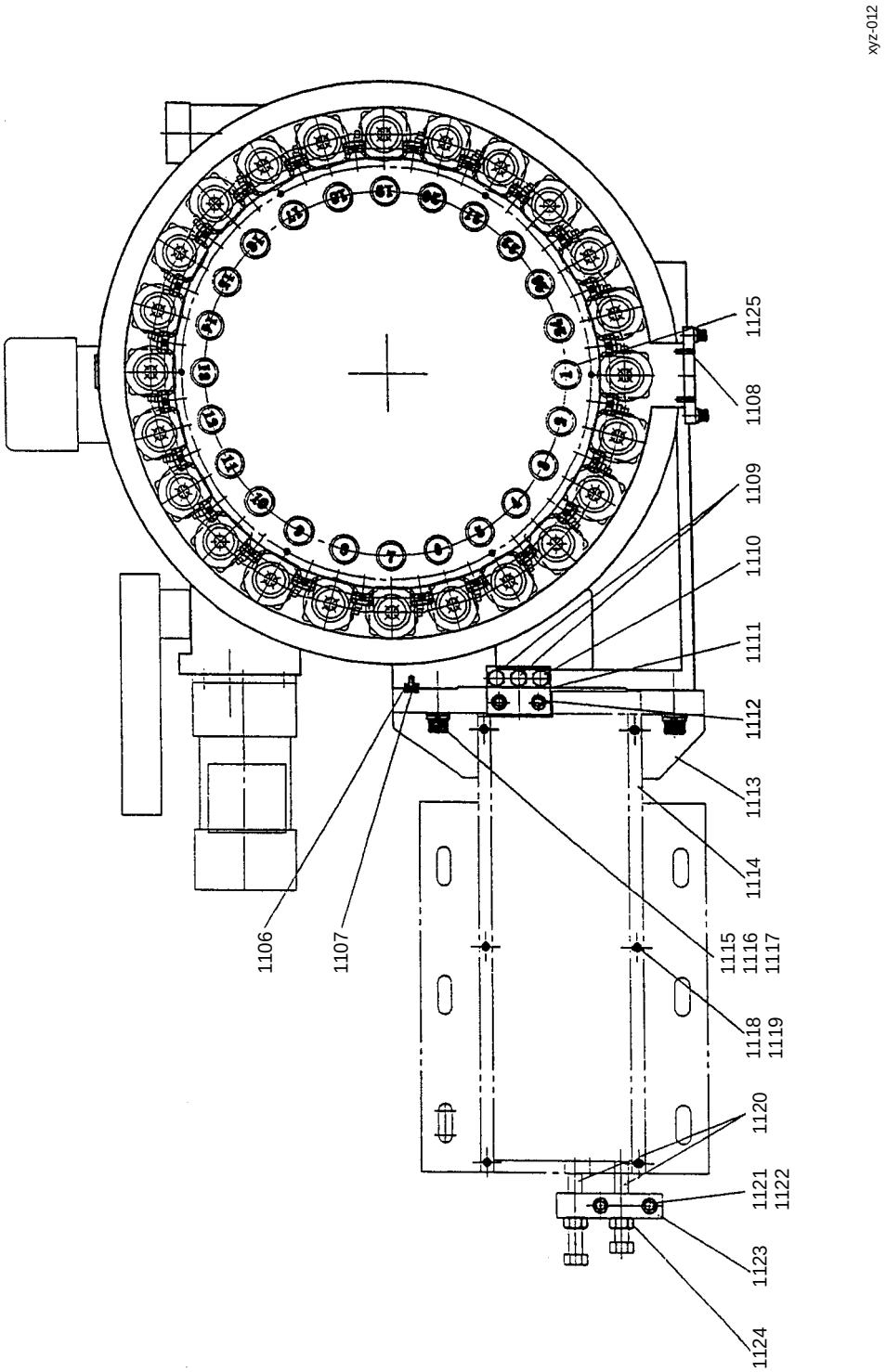


Figure 93 Support block assembly

10.2.6 Support Block Assembly

Item No	Part Number	Description	Quantity	Remarks
1106		Key	2	S45C
1107		Hexagon Socket Hd Cap Screw	2	M6x16L
1108		Pin	2	Ø6x20L
1109		Hexagon Socket Hd Set Screw	3	M12x80L
1110		Hexagon Nut	3	M12
1111		Adjustable	1	S45C
1112		Hexagon Socket Hd Cap Screw	2	M12x30L
1113		Connector Bracket	1	SS41
1114		Pushing Cap	1	SPHC
1115		Hexagon Socket Hd Cap Screw	4	M16x60L
1116		Spring Washer	4	M16
1117		Washer	4	M16
1118		Hexagon Socket Hd Cap Screw	6	M6x10L
1119		Spring Washer	6	M6
1120		Hexagon Screw	2	M16x110L
1121		Hexagon Socket Hd Cap Screw	2	M12x95L
1122		Spring Washer	2	M12
1123		Adjustable Table	1	SS41
1124		Hexagon Nut	2	M16
1125		Pocket	24	

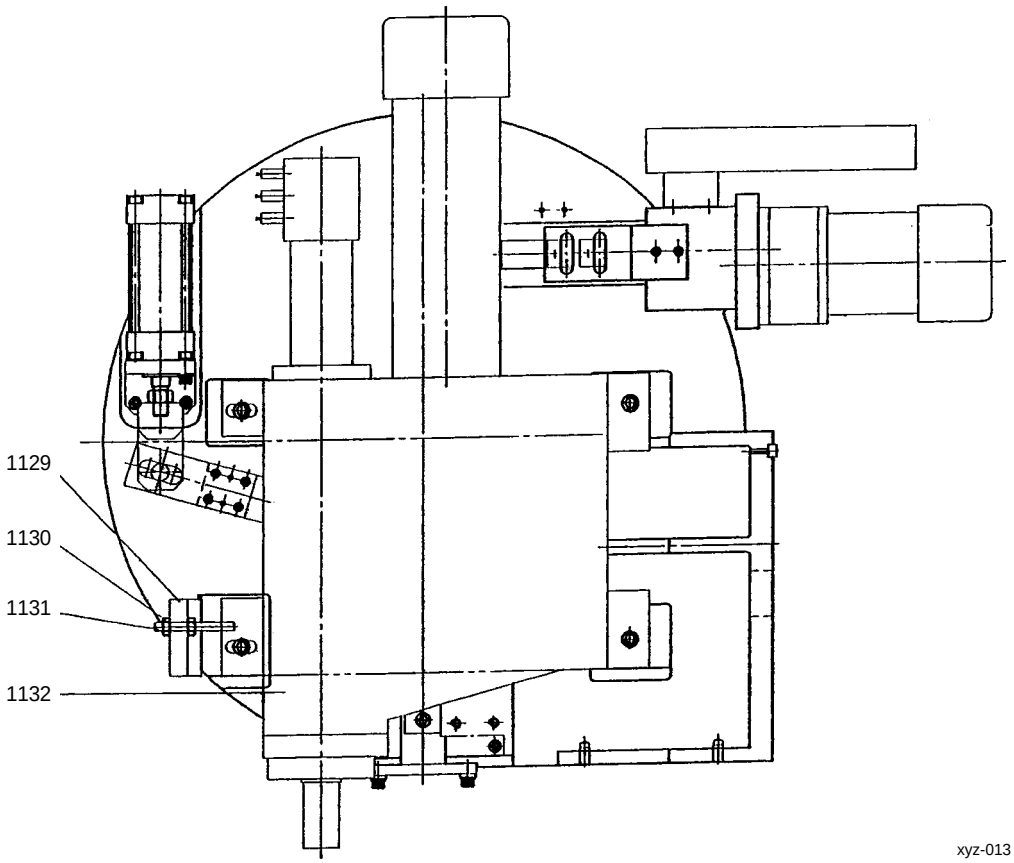


Figure 94 ATC Adjusting block assembly

10.2.7 ATC Adjusting Block Assembly

Item No	Part Number	Description	Quantity	Remarks
1129		Adjustable Table	1	SS41
1130		Hexagon Nut	2	M10
1131		Hexagon Socket Hd Set Screw	1	M10x90L
1132		Automatic Tool Changer	1	

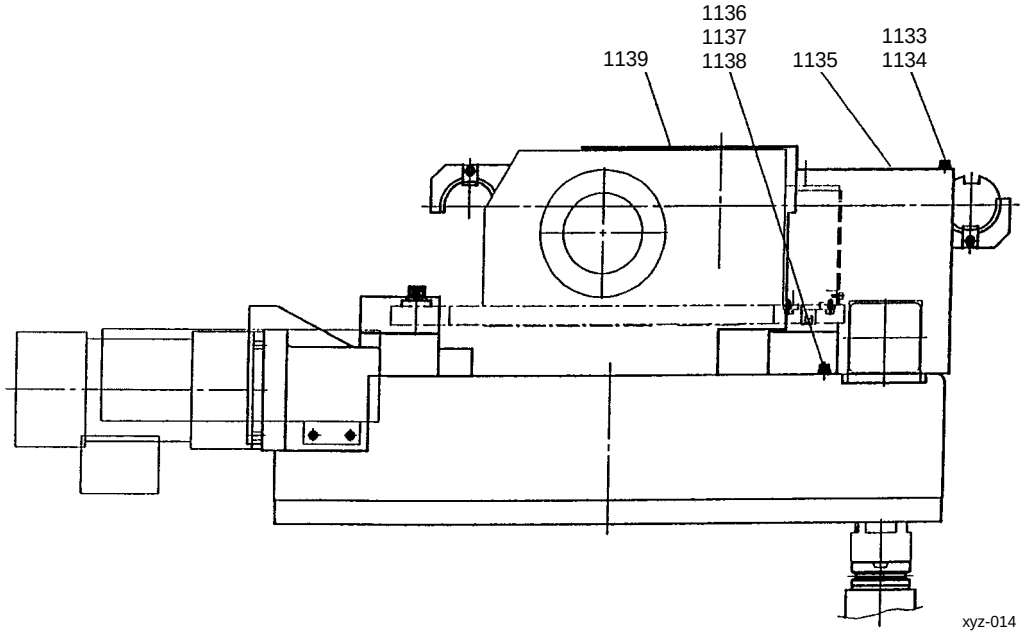


Figure 95 ATC protector assembly

10.2.8 ATC Protector Assembly

Item No	Part Number	Description	Quantity	Remarks
1133		Hexagon Socket Hd Cap Screw	7	M6x10L
1134		Spring Washer	7	M6
1135		Pushing Cap	1	SPHC
1136		Hexagon Socket Hd Cap Screw	5	M6x16L
1137		Spring Washer	5	M6
1138		Washer	5	M6
1139		ATC Protector	1	SPHC

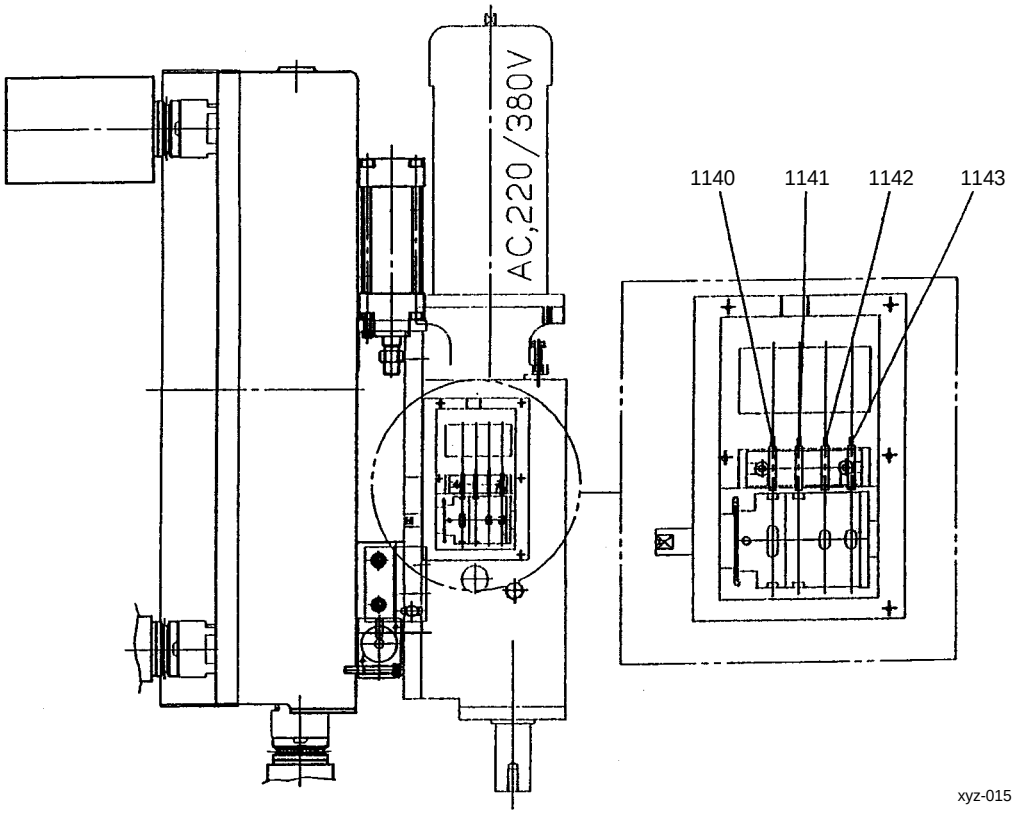


Figure 96 ATC sensor assembly

10.2.9 ATC Sensor Assembly

Item No	Part Number	Description	Quantity	Remarks
1140		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Arm Stop Position
1141		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Tool ClampLU NCL AMF
1142		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Arm Origin
1143		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Arm Detector

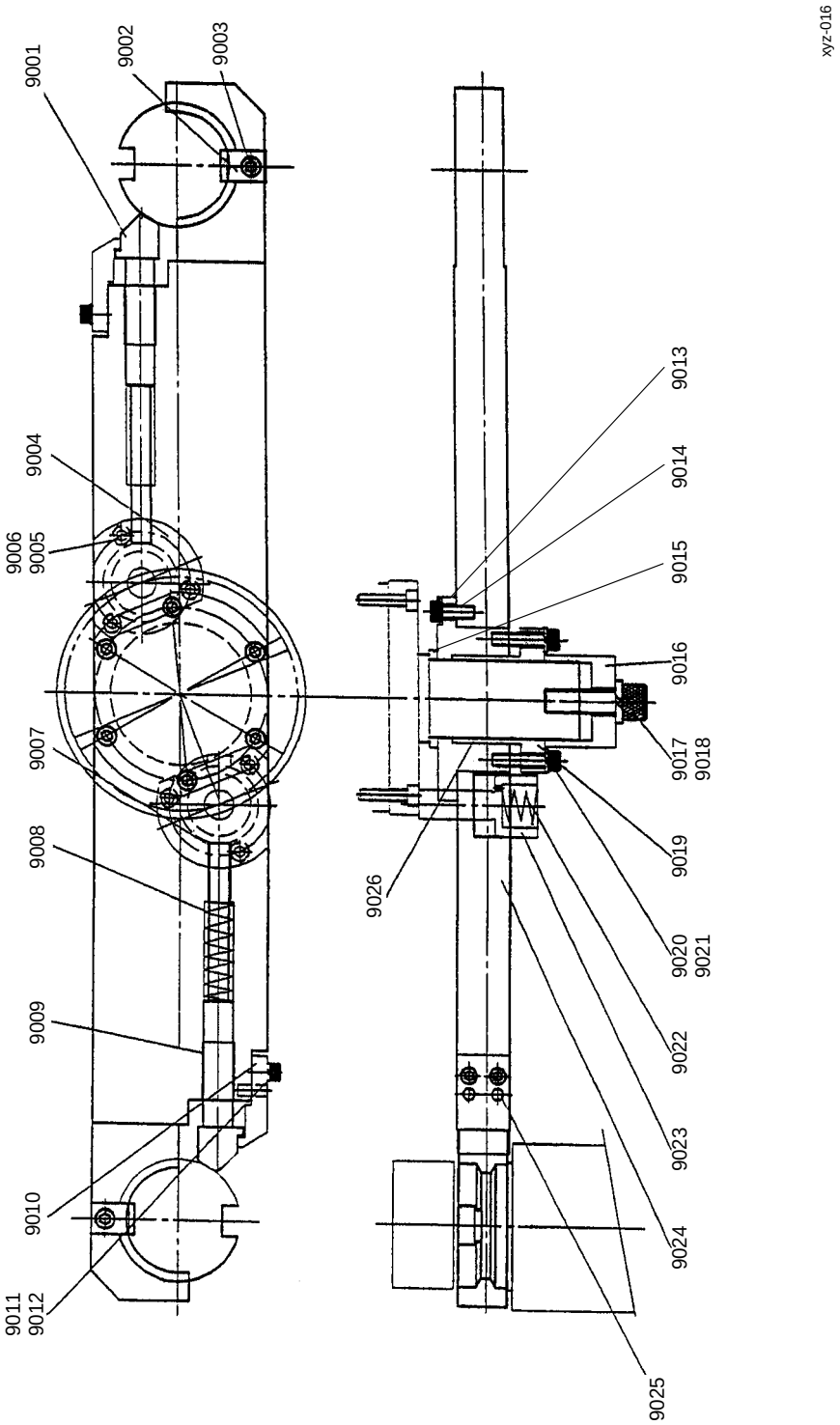


Figure 97 Tool change arm assembly

10.2.10 Tool Change Arm Assembly

Item No	Part Number	Description	Quantity	Remarks
9001		Rod	2	SKD11
9002		Block	2	S45C
9003		Round Hexagon Socket Hd Cap Screw	2	M6x10
9004		Fixing Plate	2	S45C
9005		Cap Bolt	6	M6x25
9006		Spring Washer	6	M6
9007		Bushing	2	LFB1010
9008			2	
9009		Bushing	4	LFB1515
9010		Lock Block	2	S45C
9011		Cap Bolt	4	M5x16
9012		Spring Washer	4	M5
9013		Fixing Plate	1	S45C
9014		Cap Bolt	6	M6x16
9015		Adjusting Plate	1	S45C
9016		Adjusting Ring	1	S45C
9017		Cap Bolt	1	M12x40
9018		Spring Washer	1	M12
9019		Adjusting Ring	1	S45C
9020		Cap Bolt	6	M6x30
9021		Spring Washer	6	M6
9022		Spring	2	
9023		Rod	2	SKD11
9024		Tool Change Arm	1	S45C
9025		Gib	4	Ø6x12
9026		Clamp Ring	3	SCE 4045

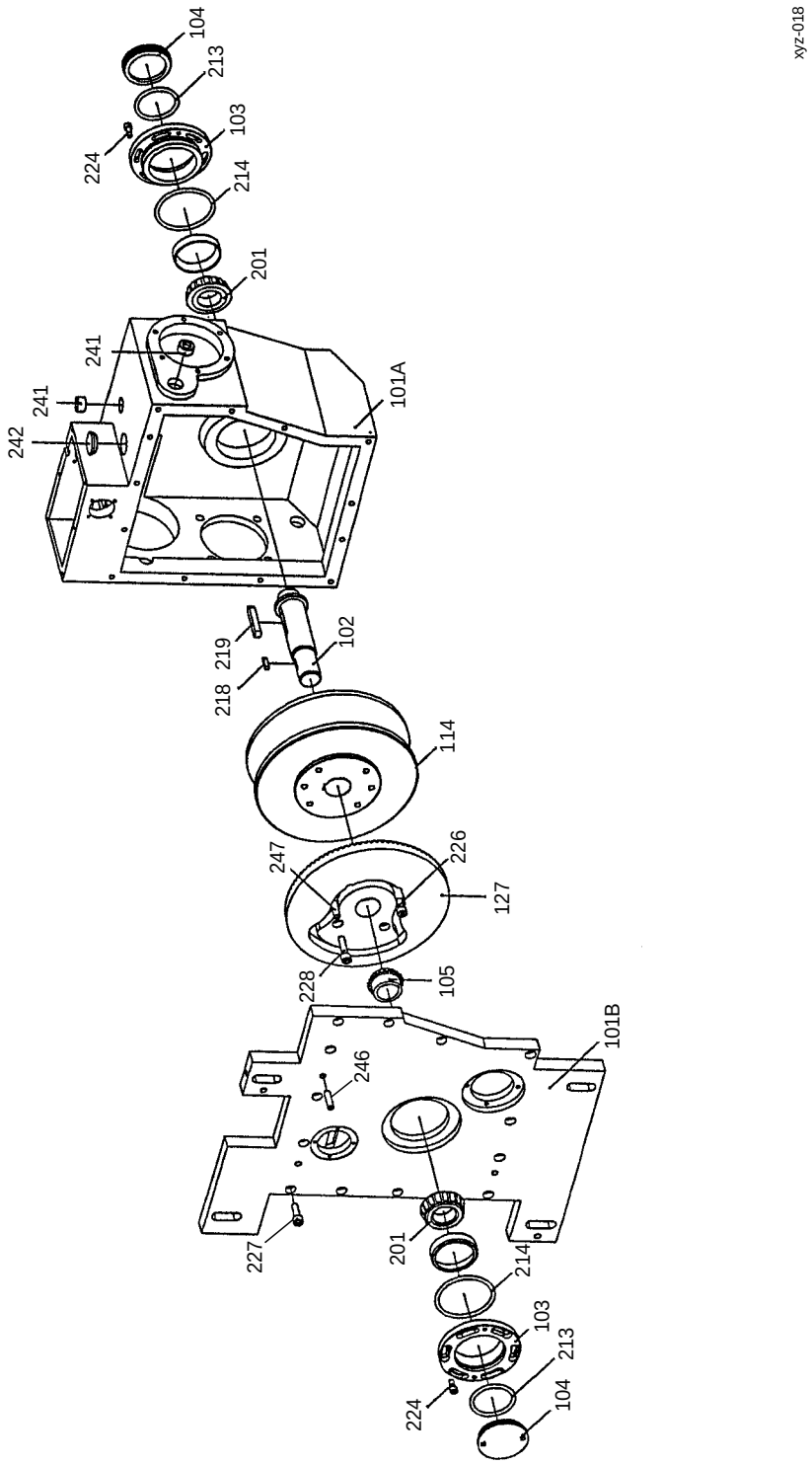


Figure 98 Input shaft

10.2.11 Input Shaft

Item No	Part Number	Description	Quantity	Remarks
101A	A4020SC000A1	Case	1	
101B	A4020SC000B1	Case Cap	1	
102	A402A0100001	Cam Shaft	1	
103	A402A0200001	Tuneup Cap	2	
104	A402A0300001	Tuneup Screw Cap	2	
105	A402A0400001	Cam Shaft Sprocket	1	
114	A402C0100000	Cam	1	
127	A402F0100001	Big Umbrella Gear	1	
201	HR30206	Tapered Roller Bearing	2	
213	O-55x2	O ring	2	Ø55x2
214	G75	O ring	2	
218	DFK5x5x20	Double Circle Key	1	5x5x20
219	DFK10x8x55	Double Circle Key	1	10x8x55
224	HI-M6x16L	Inside Hexagonal Screw	12	M6x16L
226	HI-M8x20L	Inside Hexagonal Screw	2	M8x20L
227	HI-M8x25L	Inside Hexagonal Screw	13	M8x25L
228	HI-M8x35L	Inside Hexagonal Screw	2	M8x35L
241	PT1/2”	Oil Plugger	4	PT1/2”
242	OI-28	Oil Plugger	1	Ø28 mm
246	PIN-T-8x32L	Taper Pin	3	8x32L (1:50)
247	PIN-P-8x30L	Parallelism Pin	2	Ø8x30L

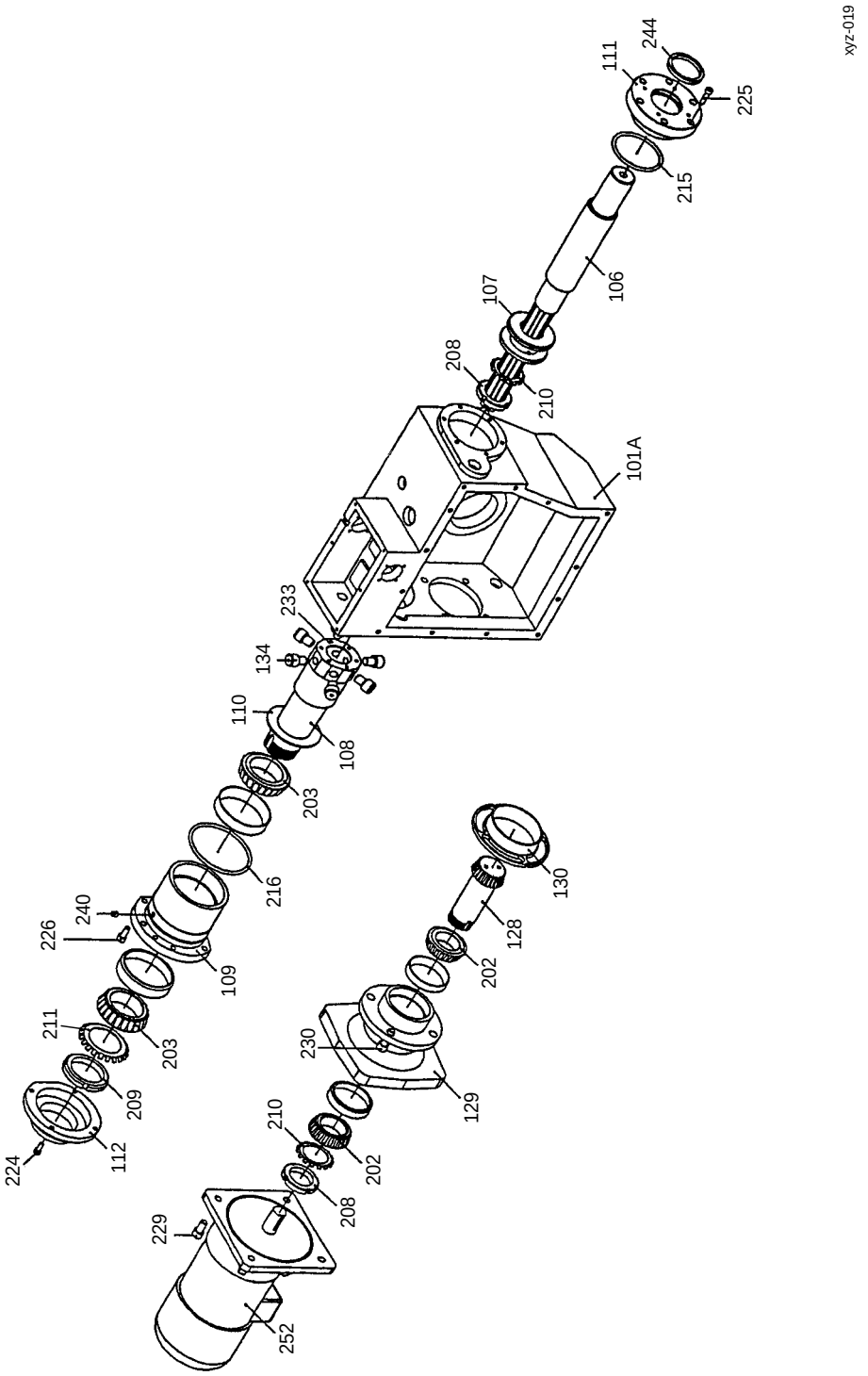


Figure 99 Output shaft

10.2.12 Output Shaft

Item No	Part Number	Description	Quantity	Remarks
101A	A4020SC000A1	Case	1	
106	A402B0100001	Spline (Output) Shaft	1	
107	A402B0200001	Transmit Wheel	1	
108	A402B0300001	Bearings Tube	1	
109	A402B0400001	Bearings Tube Fixture	1	
110	A402B0500001	Bearings Tube Gasket	1	
111	A402B0600001	Front Fix Cap	1	
112	A402B0900001	Back Fix Cap	1	
128	A402F0200001	Small Umbrella Gear	1	
129	A402F0300001	Motor Fixture	2	
130	A402F0900001	Adjustment Sheet	1	
134	RB00020000A1	Bearing	6	Ø20
202	HR32008	Tapered Roller Bearing	2	
203	HR32011	Tapered Roller Bearing	2	
208	AN08	Sun's Unit	1	
209	AN11	Sun's Unit	1	
210	AW08	Sun's Gasket	1	
211	AW11	Sun's Gasket	1	
215	G80	O ring	1	
216	G100	O ring	1	
224	HI-M6x16L	Inside Hexagonal Screw	4	M6x16L
225	HI-M6x25L	Inside Hexagonal Screw	6	M6x25L
226	HI-M8x20L	Inside Hexagonal Screw	5	M8x20L
229	HI-M10x20L	Inside Hexagonal Screw	4	M10x20L
230	HI-M10x30L	Inside Hexagonal Screw	4	M10x30L
233	HS-M6x8L	Settled Screw	6	M6x8L
240	PT1/8"	Oil Plugger	1	
244	USH50x60x6	USH Type Oil Seal	1	50x60x6
252	MR 1/2HP	Motor	1	1/2 HP

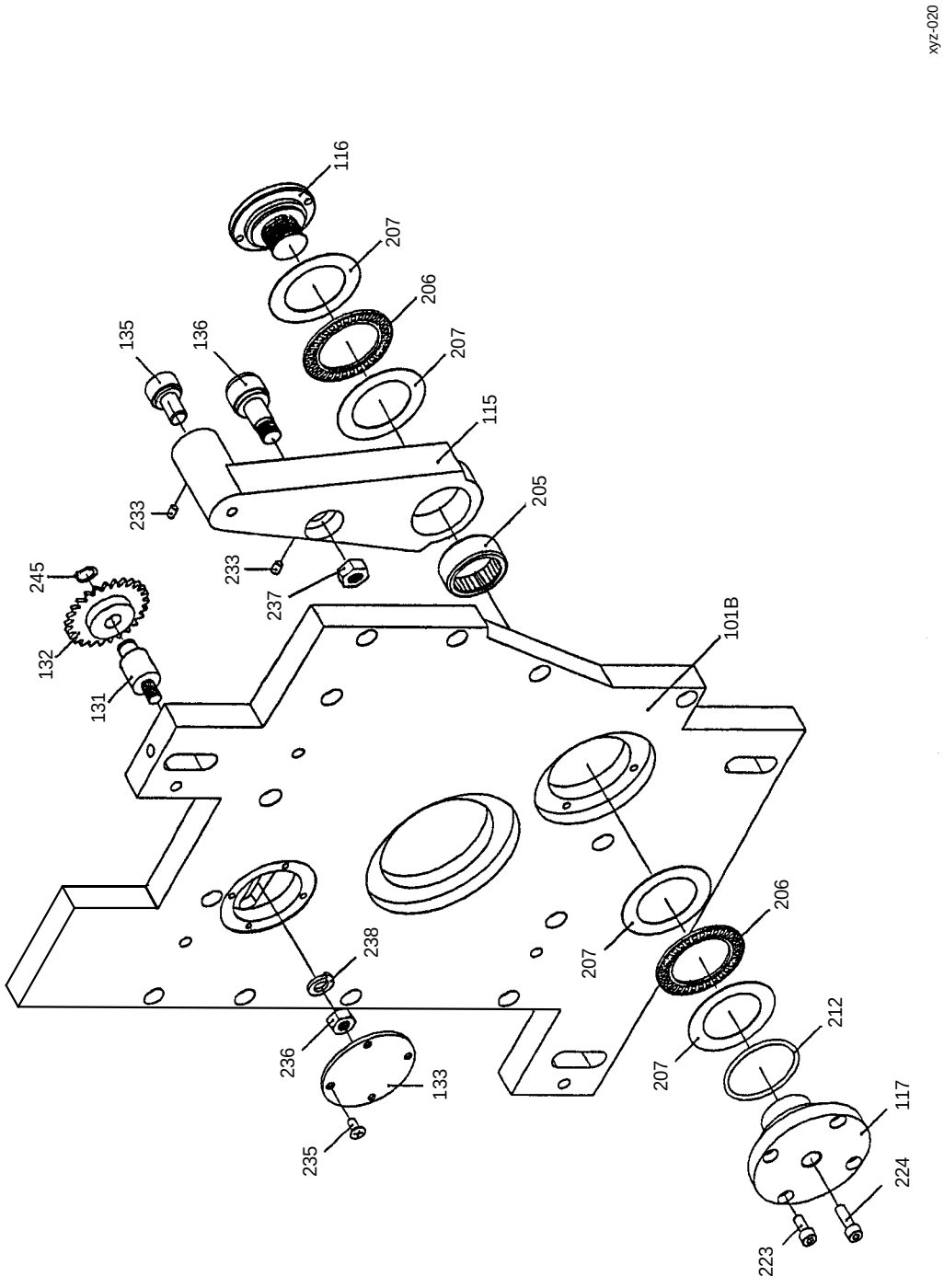


Figure 100 Idler sprocket and rocker

10.2.13 Idler Sprocket and Rocker

Item No	Part Number	Description	Quantity	Remarks
101B	A4020SC000B1	Case Cap	1	
115	A402D0100001	Rocker	1	
116	A402D0200001	Rocker Shaft	1	
117	A402D0300001	Rocker Stand Packing Cap	1	
131	A402J0100001	Idler Shaft	1	
132	A402J0200001	Idler Sprocket	1	
133	A402J0300001	Idler Outside Cap	1	
135	RB00022000A1	Bearing	1	Ø22
136	RB00024000A2	Bearing	1	Ø24
205	HK3516	Needle Bearing	1	
206	AXK1108	Thrust Bearing	2	
207	AS1108	Thrust Bearing Parcel	4	
212	G50	O ring	1	
223	HI-M6x14L	Inside Hexagonal Screw	4	M6x14L
224	HI-M6x16L	Inside Hexagonal Screw	1	
233	HS-M6x8L	Settled Screw	2	M6x8L
235	CO-M5x8L	Bury Screw	4	M5x8L
236	SC-M10	Hexagonal Screw Cap	1	M10
237	SC-M12	Hexagonal Screw Cap	1	M12
238	WS-M10	Gasket	1	M10
245	C12S	Circlip	1	C12

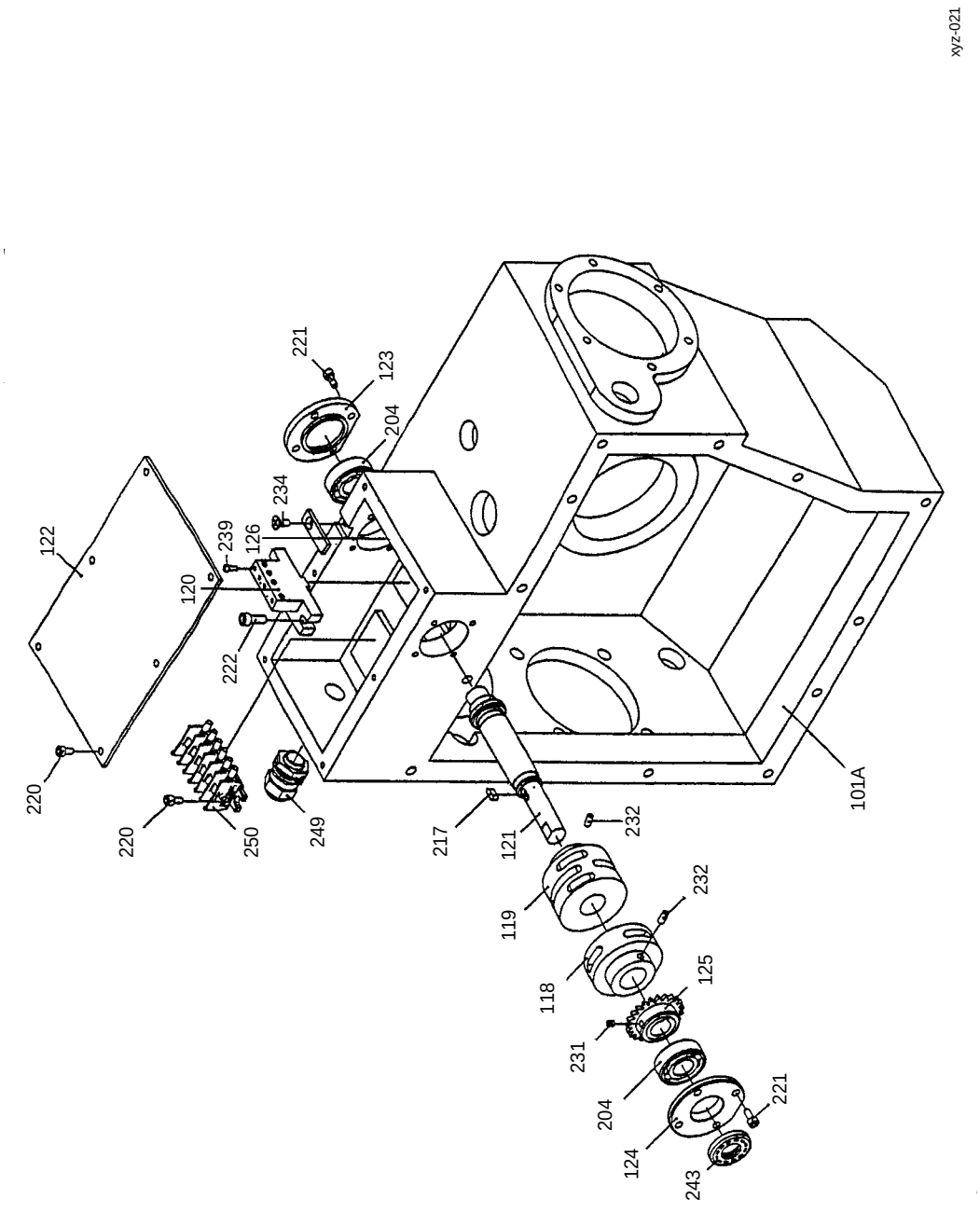


Figure 101 Signal

10.2.14 Signal

Item No	Part Number	Description	Quantity	Remarks
101A	A4020SC000A1	Case	1	
118	A402E01000A1	Brake Signal Wheel	1	
119	A402E01000B1	Cam Signal Wheel	1	
120	A402E0200001	Signal Fixture	1	
121	A402E0300001	Signal Shaft	1	
122	A402E0400001	Dustproof Cap	1	
123	A402E0500001	Signal Cap	1	
124	A402E0600001	Signal Cap	1	
125	A402E0700001	Signal Sprocket	1	
126	A402E0800001	Signal Try Up Parcel	1	
204	BR6202	Deep Groove Ball Bearing	4	
217	DFK4x4x10	Double Circle Key	4	4x4x10
220	HI-M4x8L	Inside Hexagonal Screw	8	M4x8L
221	HI-M4x10L	Inside Hexagonal Screw	8	M4x10L
222	HI-M5x16L	Inside Hexagonal Screw	2	M5x16L
231	HS-M5x5L	Settled Screw	1	M5x5L
232	HS-M5x10L	Settled Screw	2	M5x10L
239	PF-308	Plastic Screw (KSS)	4	M3x8L
243	TC15x24x5	TC Type Oil Seal	1	15x24x5
249	AG-16	Wire Stud (KSS)	1	
250	TM-10A600V	Terminal Frisket	1	C12

11.0 Parts List

11.1 XYZ VMC 710 Parts List

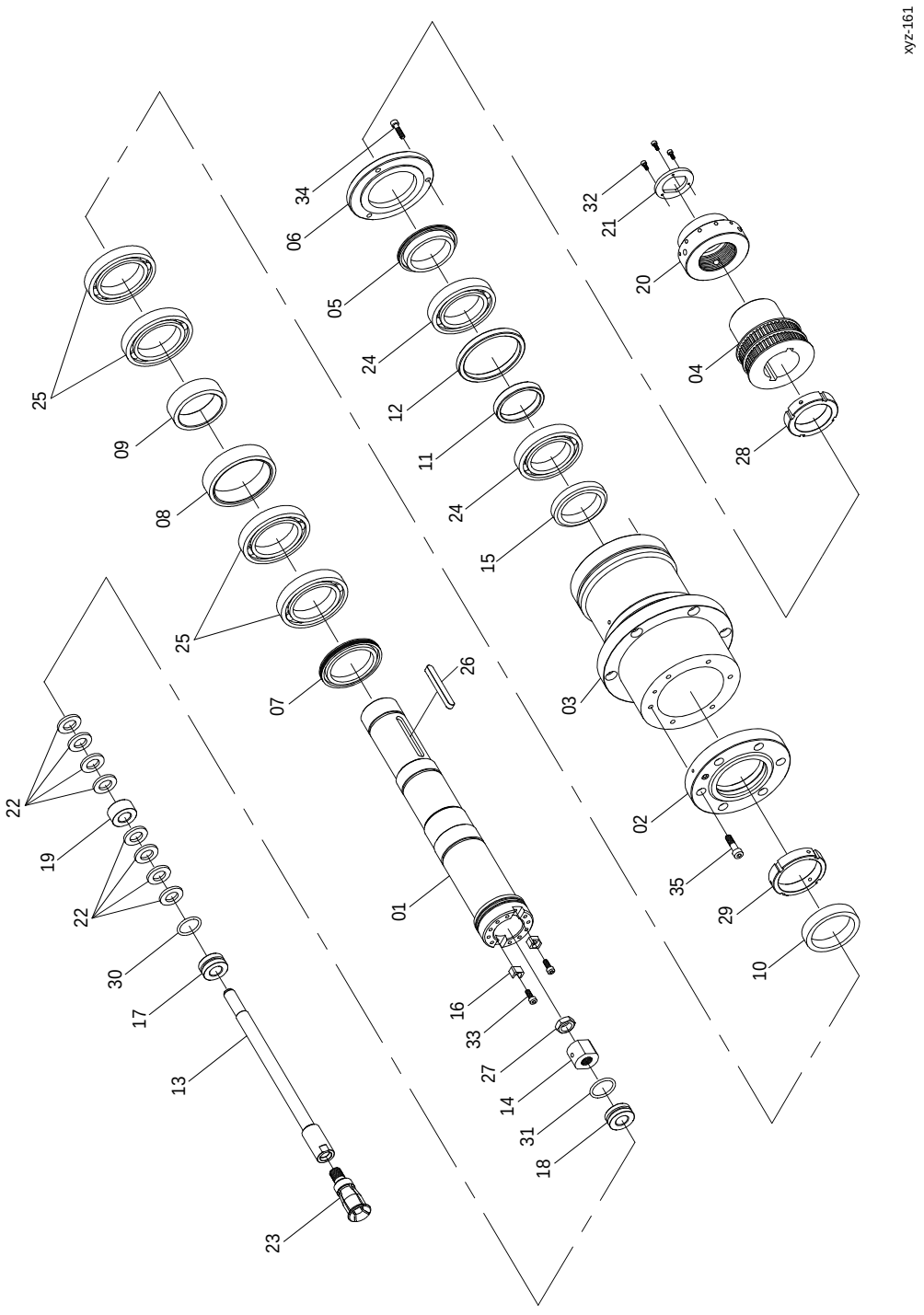


Figure 102 Spindle drive assembly

11.1.1 Spindle Drive Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT010013	Spindle	1	
2	MT010030	Spindle Pulley	1	
3	MT010050	Spindle Housing	1	
4	MT010060	Front Bearing Cover	1	
5	MT010070	Spacer	1	
6	MT010080	Rear Bearing Cover	1	
7	MT001090	Shaft Cover	1	
8	MT010100	Spacer	1	
9	MT010110	Spacer	1	
10	MT010120	Spacer	1	
11	MT010130	Spacer	1	
12	MT010140	Spacer	1	
13	MT010161	Pull Rod	1	
14	MT010171	Lock Nut	1	
15	MT010210	Spacer	1	
16	MT010220	Dog	2	
17	MT010230	Front Bearing Cover	1	
18	MT010250	Spacer	1	
19	MT010261	Spacer	2	
20	MT020082	Nut	1	
21	MT020092	Fixed Plate	1	
22	A600000130	Dish Spring	87	
23	A70000040	Gripper	1	
24	AB7012	Ball Bearing	2	7012
25	AB7013	Ball Bearing	4	7013
26	AK1008070	Key	1	10x8x70L
27	ANM115016	Nut	1	M16x1.5
28	ANN420060	Lock Nut	1	M60x2.0
29	ANN420065	Lock Nut	1	M65x2.0
30	AOR350307	Oil Ring	1	Ø30.7x3.5
31	AOR350312	Oil Ring	1	Ø31.2x3.5
32	ASM604010	Hexagon Socket Cap Hd Screw	3	M4x10L
33	ASM606016	Hexagon Socket Cap Hd Screw	2	M6x16L
34	ASM606025	Hexagon Socket Cap Hd Screw	3	M6x25L

Item No	Part Number	Description	Quantity	Remarks
35	ASM608030	Hexagon Socket Cap Hd Screw	6	M8x30L

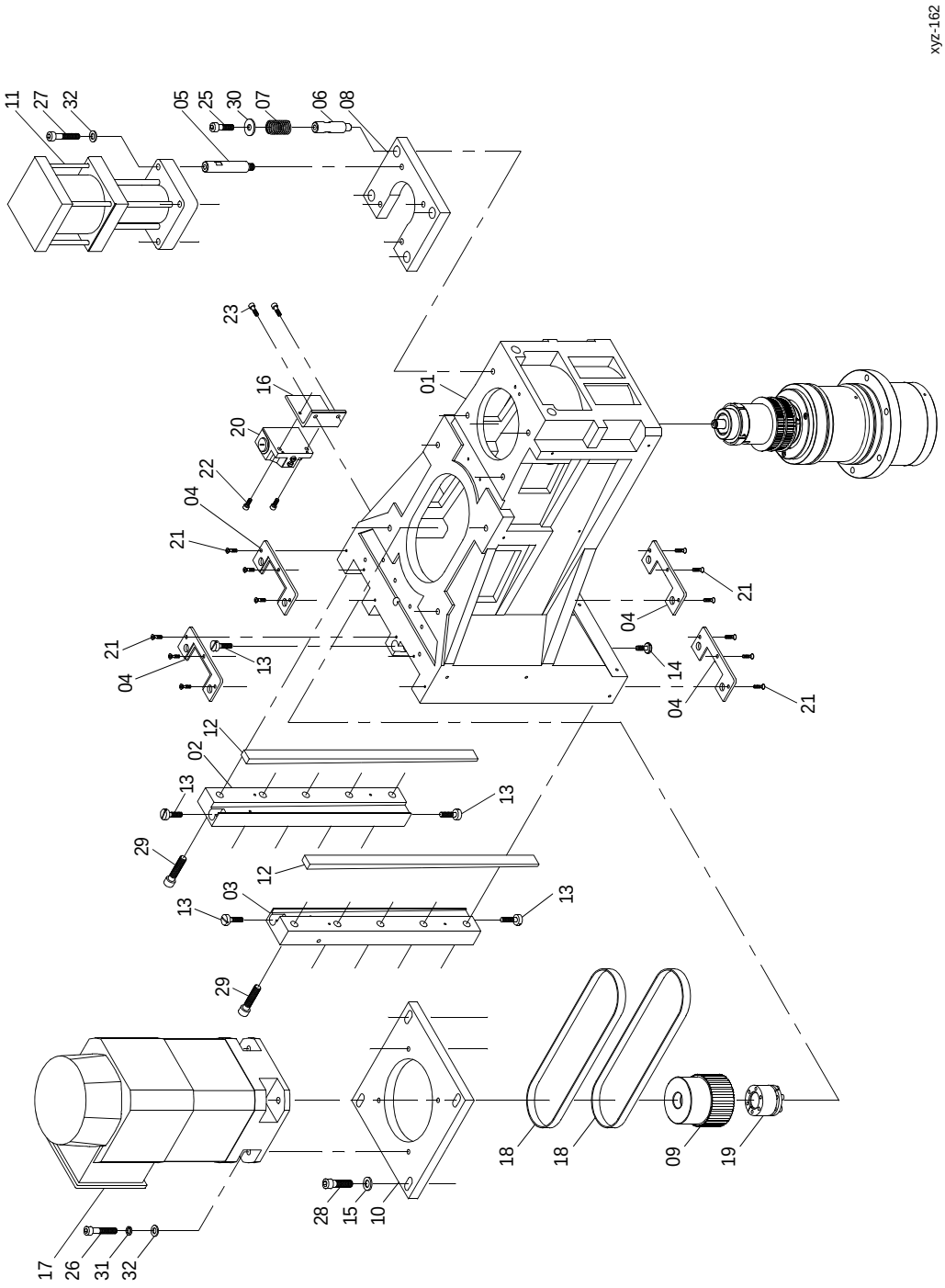


Figure 103 Head assembly

11.1.2 Head Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT020010	Head	1	
2	MT020020	Gib Seat	1	
3	MT020030	Gib Seat	1	
4	MT020060	Cross Slide Wiper	4	
5	MT020100	Support Bolt	4	
6	MT020110	Support Bolt	4	
7	MT020180	Compression Spring	4	Ø24.5
8	ML020070	Tool Ejector Bracket	1	
9	MS010022	Motor Pulley	1	
10	MS010041	Spindle Motor Bracket	1	
11	MS010300	Tool Ejector	1	
12	MS020040	Gib	2	
13	MS020120	Adjust Screw	5	
14	MS020130	Adjust Screw	1	
15	MS020190	Washer	4	M12
16	MS130100	Limit Switch Bracket	1	
17	AMOS322010	Motor	1	
18	ABE0500825	Belt	2	5GT-825-15
19	A600001010	Coupling	1	
20	ED610030	Limit Switch	1	BNS 819-B02-L12-61-12-10
21	ASM105020	Button Head Cap Screw	12	M5x20L
22	ASM606016	Hexagon Socket Cad Hd Screw	2	M6x16L
23	ASM606020	Hexagon Socket Cad Hd Screw	2	M6x20L
24	ASM610030	Hexagon Socket Cad Hd Screw	6	M10x30L
25	ASM610035	Hexagon Socket Cad Hd Screw	4	M10x35L
26	ASM610045	Hexagon Socket Cad Hd Screw	4	M10x45L
27	ASM610055	Hexagon Socket Cad Hd Screw	4	M10x55L
28	ASM612045	Hexagon Socket Cad Hd Screw	4	M12x45L
29	ASM612055	Hexagon Socket Cad Hd Screw	4	M12x55L
30	AWMH01010	Height Bright Washer	4	M10

Item No	Part Number	Description	Quantity	Remarks
31	AWMS01010	Spring Washer	4	M10
32	AWMT01010	Bright Washer	8	M10

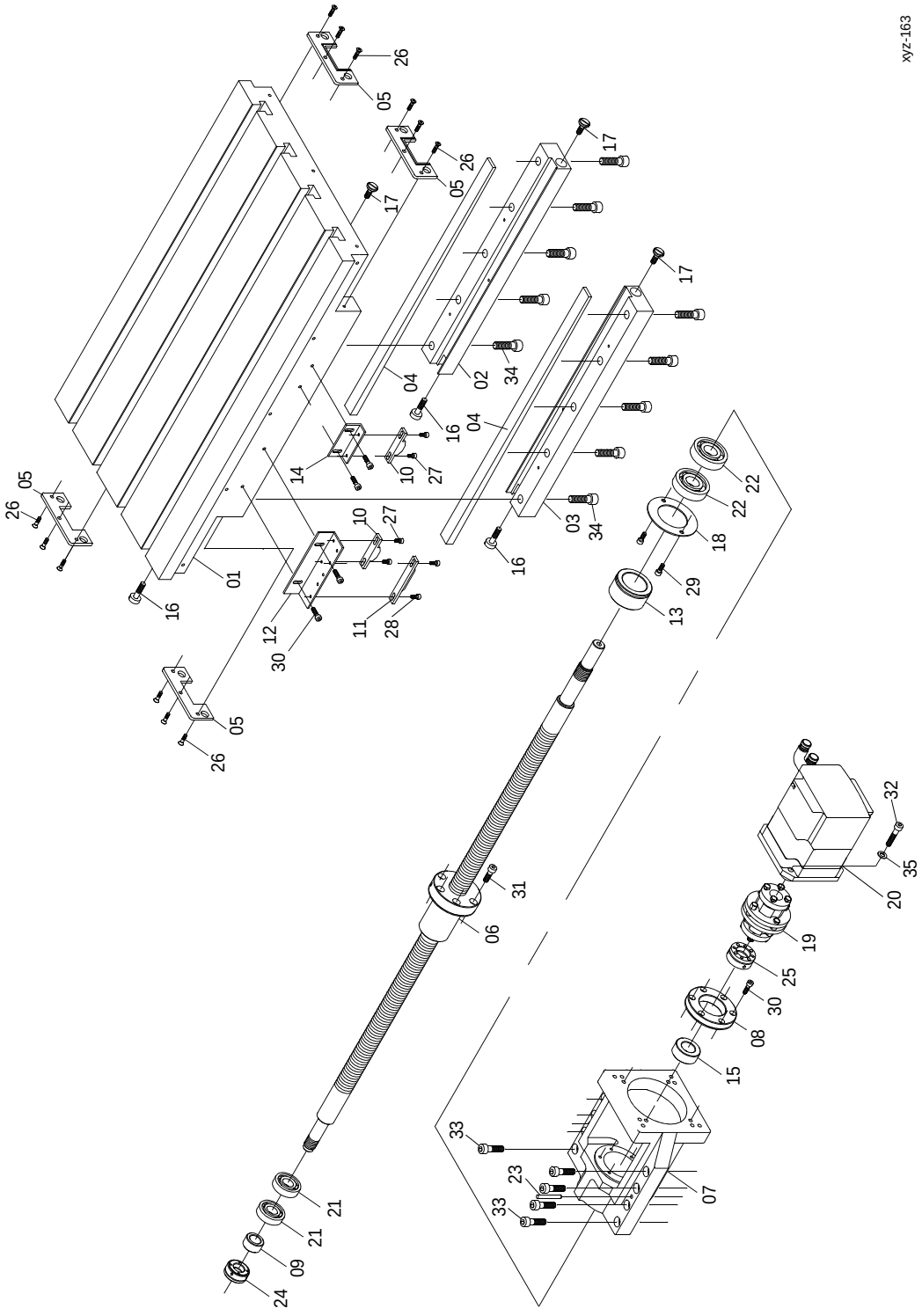


Figure 104 Table assembly

11.1.3 Table Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT060010	Table	1	
2	MT060020	Gib Seat	1	
3	MT060030	Gib Seat	1	
4	MT060040	Gib	2	
5	MT060060	Cross Slide Wiper	4	
6	MT110010	X Axis Ball Screw	1	
7	MT110021	Motor Bracket	1	
8	MT110030	Bearing Cover	1	
9	MT110080	Spacer	1	
10	MT110090	Limit Switch Dog	2	
11	MT110100	Limit Switch Dog	1	
12	MT110110	Limit Switch Base	1	
13	MT110120	X Axis Rear Housing Cover	1	
14	MT110170	Limit Switch Base	1	
15	MT130080	Spacer	1	
16	MS020120	Adjust Screw	3	
17	MS020130	Adjust Screw	3	
18	MS130150	Cover	1	
19	A600001030	Coupling	1	CPT62422
20		Motor	1	1FK7060-5
21	AB204760	Ball Bearing	2	20BS47DH
22	AB25620	Ball Bearing	2	25BS62DH
23	AK106040	Pin	2	Ø6x40L
24	ANN515020	Lock Nut	1	M20x1.5
25	ANN515025	Lock Nut	1	M25x1.5
26	ASM105020	Button Head Cap Screw	12	M5x20L
27	ASM605010	Hexagon Socket Cap Hd Screw	4	M5x10L
28	ASM605012	Hexagon Socket Cap Hd Screw	2	M5x12L
29	ASM606016	Hexagon Socket Cap Hd Screw	2	M6x16L
30	ASM606020	Hexagon Socket Cap Hd Screw	10	M6x20L
31	ASM608025	Hexagon Socket Cap Hd Screw	5	M8x25L
32	ASM608040	Hexagon Socket Cap Hd Screw	4	M8x40L

Item No	Part Number	Description	Quantity	Remarks
33	ASM610035	Hexagon Socket Cap Hd Screw	8	M10x35L
34	ASM612040	Hexagon Socket Cap Hd Screw	10	M12x40L
35	AWMH01008	Washer	4	M8

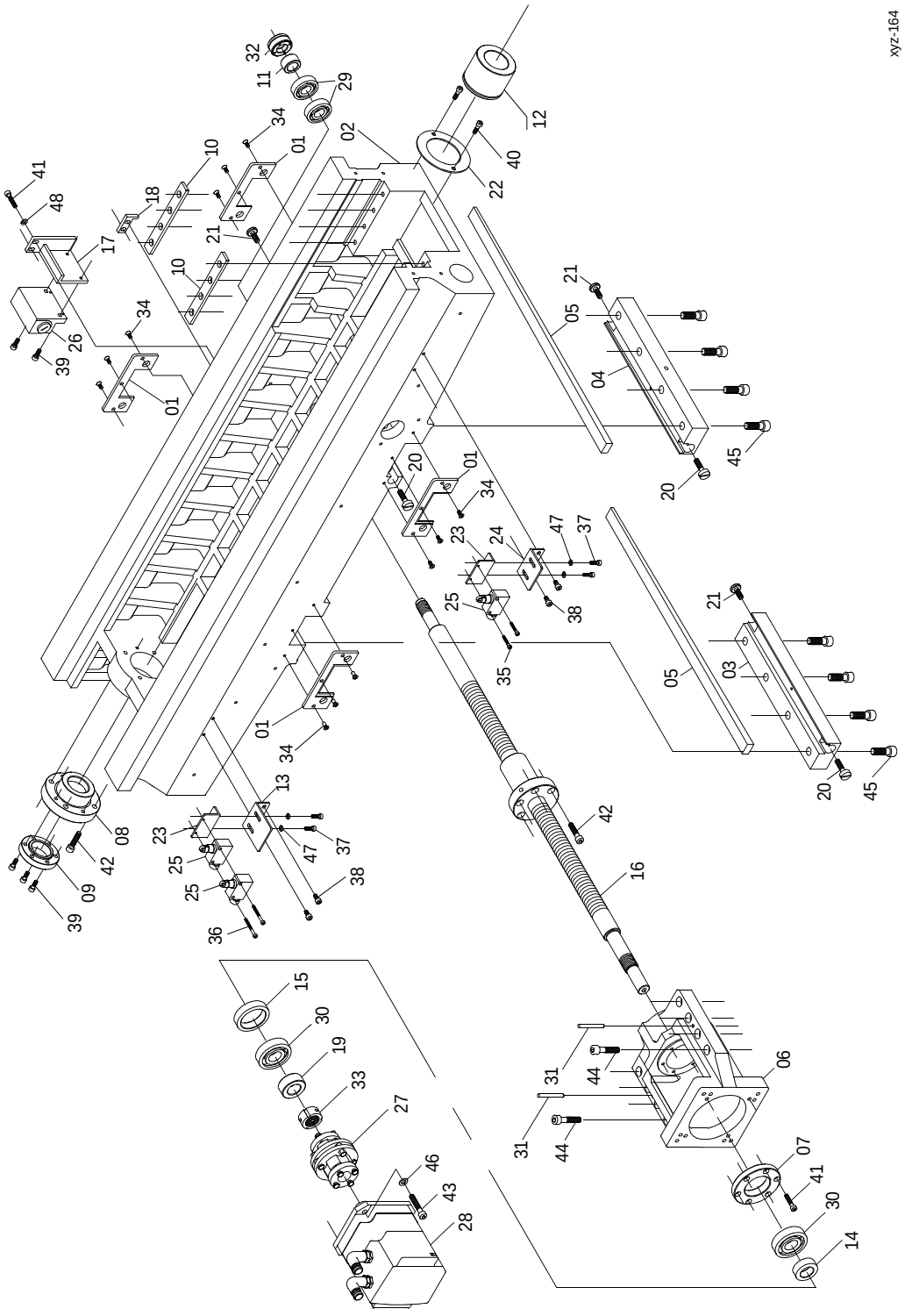


Figure 105 Saddle assembly

11.1.4 Saddle Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT020060	Cross Slide Wiper	4	
2	MT050010	Saddle	1	
3	MT050020	Gib Seat	1	
4	MT050030	Gib Seat	1	
5	MT060040	Gib	1	
6	MT110021	Motor bracket	1	
7	MT110030	Bearing Cover	1	
8	MT110040	Bearing Bracket	1	
9	MT110050	Bearing Cover	1	
10	MT110070	Spacer	2	
11	MT110080	Spacer	1	
12	MT110130	X Axis Rear Housing Cover	1	
13	MT110140	Limit Switch Base	1	
14	MT110210	Spacer	1	
15	MT110220	Spacer	1	
16	MT120010	Y Axis Ball Screw	1	
17	MT120060	Limit Switch Base	1	
18	MT120070	Limit Switch Dog	1	
19	MT130080	Spacer	1	
20	MS020120	Adjust Screw	3	
21	MS020130	Adjust Screw	3	
22	MS110180	Cover	1	
23	MX110150	Limit Switch Base	2	
24	MX110160	Limit Switch Base	1	
25	ED610040	Limit Switch	3	SL1-A
26	ED610030	Limit Switch	1	BNS819-B02-L12-61-12-10
27	A600001020	Coupling	1	CPT62425
28		Motor	1	1FK7060-5
29	AB204760	Ball Bearing	2	20BS47DH
30	AB256260	Ball Bearing	2	25BS62DH
31	AKP106040	Pin	2	Ø6x40L
32	ANN510020	Lock Nut	1	YSK M20x1.0
33	ANN515025	Lock Nut	1	YSK M25x1.5
34	ASM105012	Button Head Cap Screw	12	M5x12L
35	ASM604025	Hexagon Socket Cap Hd Screw	2	M4x25L

Item No	Part Number	Description	Quantity	Remarks
36	ASM604040	Hexagon Socket Cap Hd Screw	2	M4x40L
37	ASM605016	Hexagon Socket Cap Hd Screw	4	M5x16L
38	ASM606012	Hexagon Socket Cap Hd Screw	4	M6x12L
39	ASM606016	Hexagon Socket Cap Hd Screw	8	M6x16L
40	ASM606020	Hexagon Socket Cap Hd Screw	2	M6x20L
41	ASM606030	Hexagon Socket Cap Hd Screw	10	M6x30L
42	ASM608035	Hexagon Socket Cap Hd Screw	9	M8x35L
43	ASM608045	Hexagon Socket Cap Hd Screw	4	M8x45L
44	ASM610045	Hexagon Socket Cap Hd Screw	8	M10x45L
45	ASM612035	Hexagon Socket Cap Hd Screw	8	M12x35L
46	AWMH01008	Height Bright Washer	4	M8
47	AWMT01005	Bright Washer	4	M5
48	AWMT01006	Bright Washer	4	M6

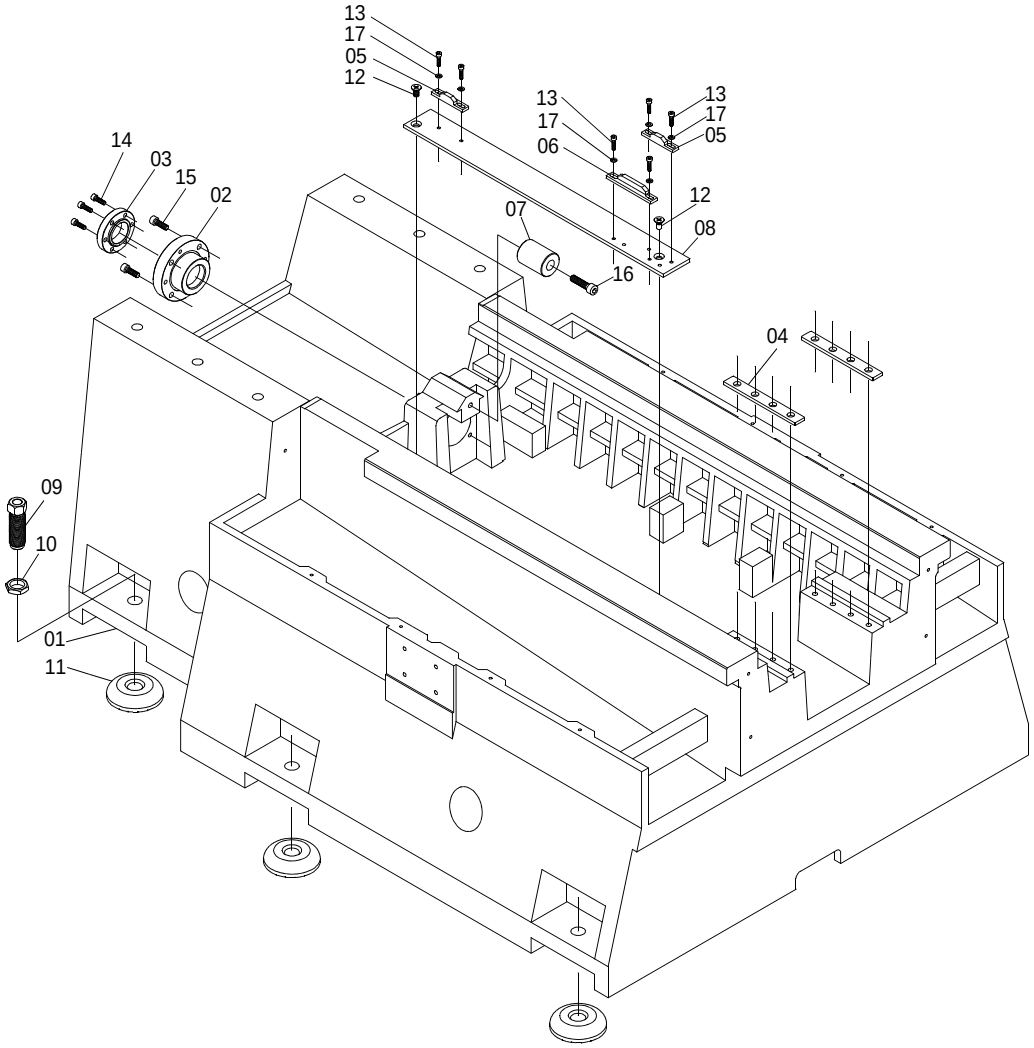


Figure 106 Base assembly

11.1.5 Base Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT040010	Base	1	
2	MT110040	Bearing Bracket	1	
3	MT110050	Bearing Cover	1	
4	MT110070	Spacer	2	
5	MT110090	Limit Switch Dog	2	
6	MT110100	Limit Switch Dog	1	
7	MT120130	Y Axis Rear Housing Cover	1	
8	MT120190	Limit Switch Base	1	
9	KR040120	Bolt	6	
10	KR040130	Nut	6	
11	KR040140	Block	6	
12	ASM108016	Button Head Cap Screw	2	M8x16L
13	ASM605020	Hexagon Socket Cap HD Screw	6	M5x20L
14	ASM606020	Hexagon Socket Cap HD Screw	6	M6x20L
15	ASM608025	Hexagon Socket Cap HD Screw	4	M8x25L
16	ASM610040	Hexagon Socket Cap HD Screw	1	M10x40L
17	AWMT01005	Washer	6	M5

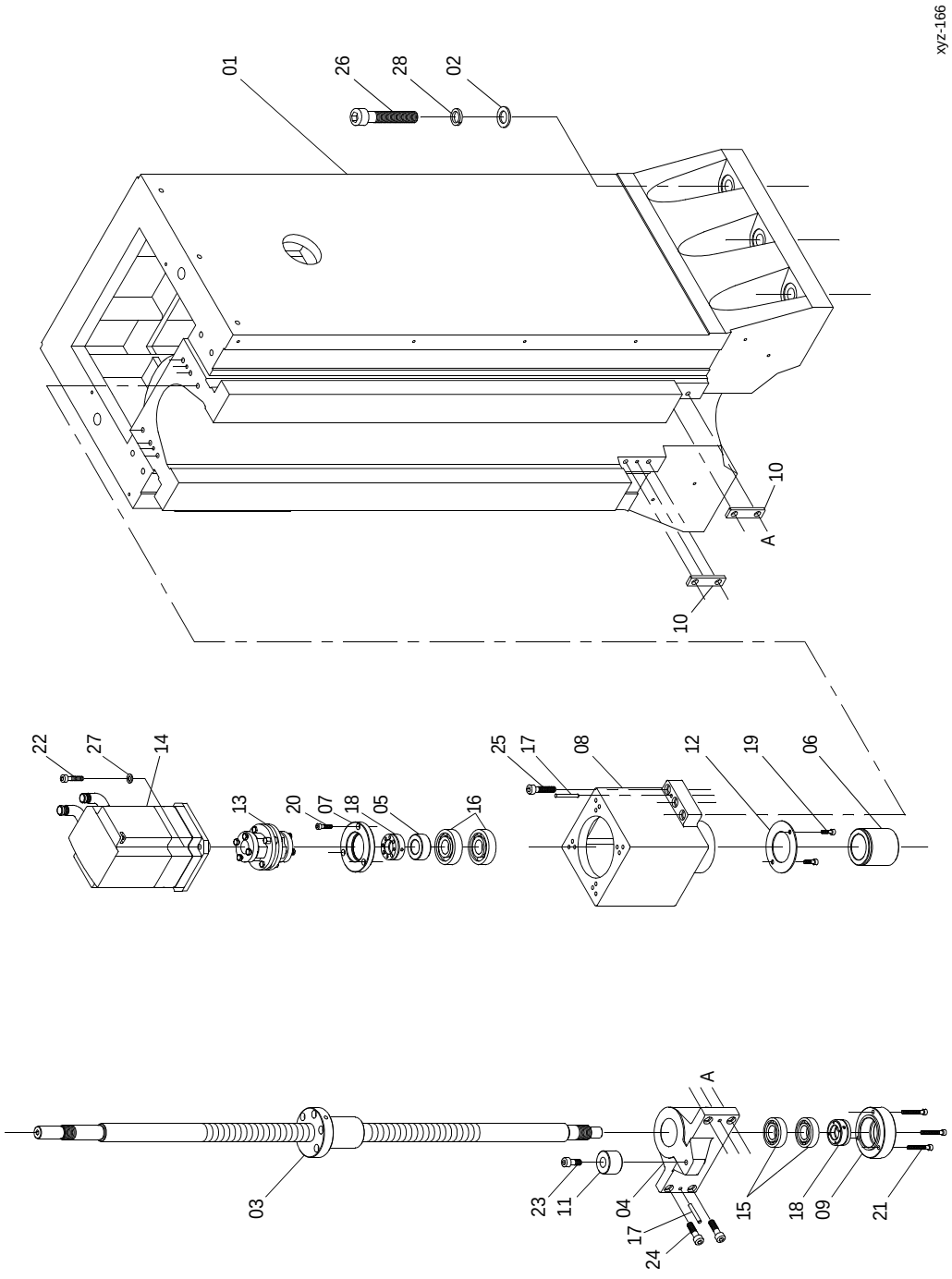


Figure 107 Column assembly

11.1.6 Column Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT030010	Column	1	
2	MT030300	Washer	6	M20
3	MT130010	Z Axis Ball Screw	1	
4	MT130040	Bearing Bracket	1	
5	MT130080	Spacer	1	
6	MT130110	Z Axis Rear Hosing Cover	1	
7	MS110030	Bearing Cover	1	
8	MS130020	Motor Bracket	1	
9	MS130050	Bearing Cover	1	
10	MS130070	Spacer	2	
11	MS130120	Shaft Cover	1	
12	MS130150	Cover	1	
13	A600001030	Coupling	1	CPT62422
14		Motor	1	1FK7063-5
15	AB255260	Ball Bearing	2	25BS52DH
16	AB255260	Ball Bearing	2	25BS52DH
17	AKP106040	Pin	4	Ø6x40L
18	ANN515025	Lock Nut	2	YSK M25x1.5
19	ASM606020	Hexagon Socket Cap Hd Screw	2	M6x20L
20	ASM606025	Hexagon Socket Cap Hd Screw	3	M6x25L
21	ASM606045	Hexagon Socket Cap Hd Screw	3	M6x45L
22	ASM608035	Hexagon Socket Cap Hd Screw	4	M8x35L
23	ASM610025	Hexagon Socket Cap Hd Screw	1	M10x25L
24	ASM610035	Hexagon Socket Cap Hd Screw	4	M10x35L
25	ASM610045	Hexagon Socket Cap Hd Screw	6	M10x45L
26	ASM620110	Hexagon Socket Cap Hd Screw	6	M20x110L
27	AWMH01008	Height Bright Washer	4	M8
28	AWMS01020	Spring washer	6	M20

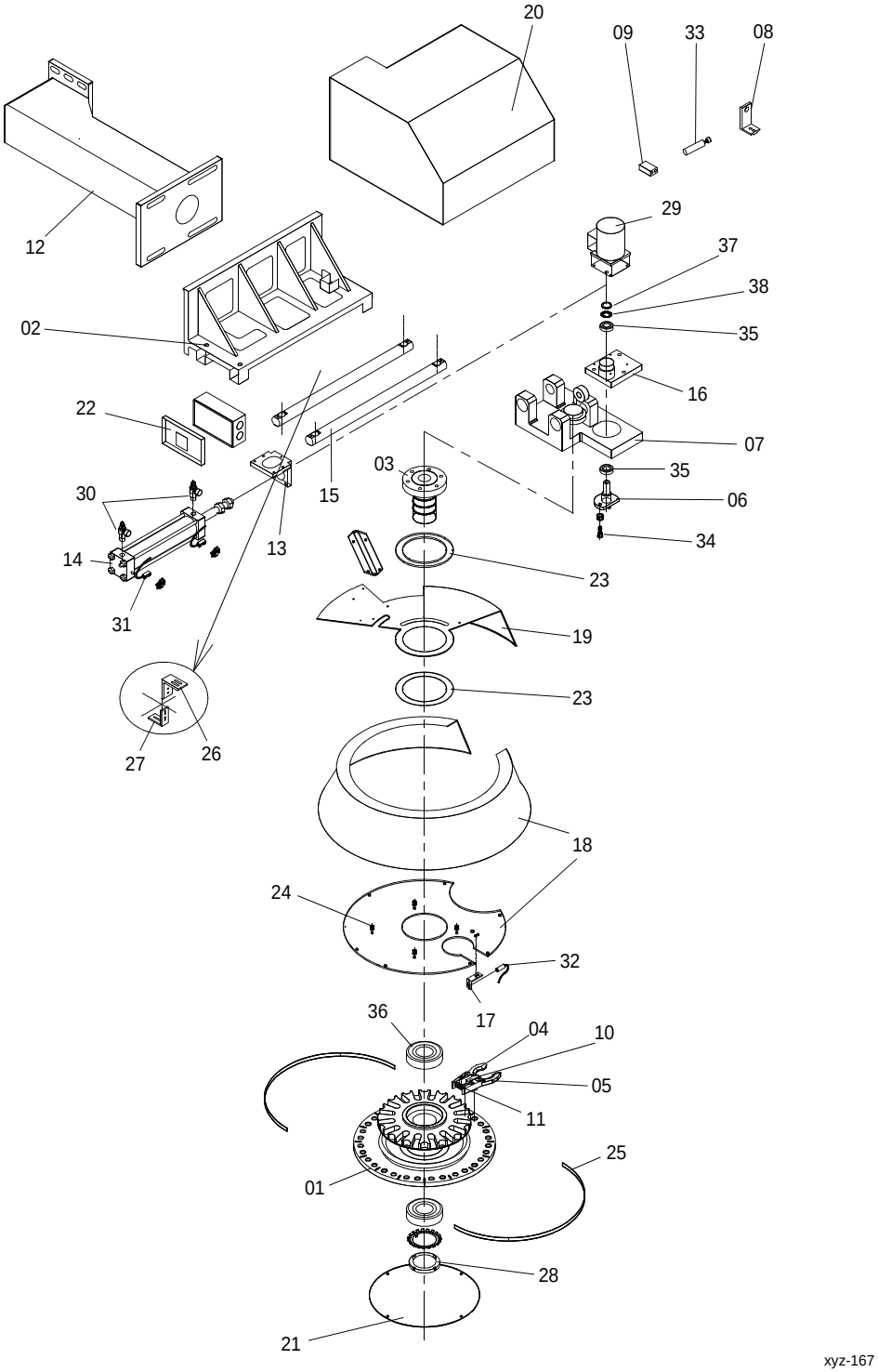


Figure 108 Magazine assembly

11.1.7 Magazine Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT520010	Tool Plate Pulley	1	
2	MT520020	Magazine Plate	1	
3	MT520030	Bracket Shaft	1	
4	MT520040	Right Clamp Finger	16	
5	MT520050	Left Clamp finger	16	
6	MT520060	Shaft	1	
7	MT520070	Sliding Plate	1	
8	MT520080	Bracket	1	
9	MT520090	Dog	1	
10	MT520100	Key	16	
11	MT520110	Spring	16	
12	MT520120	Magazine Bracket	1	
13	MT520130	Sliding Cylinder Plate	1	
14	MT520140	Sliding Cylinder	1	
15	MT520150	Guide Rail	2	
16	MT520160	Motor Bearing Housing	1	
17	MT520170	Switch Stand	1	
18	MT520180	Round Plate Cover	1	
19	MT520190	Automatic Cover	1	
20	MT520200	Bracket Cover	1	
21	MT520210	Bearing Plate Cover	1	
22	MT520250	Wiring Case	1	
23	MT520270	Automatic Mould plate	1	
24	MT520290	Automatic Use Washer	1	
25	MT520300	Dial	1	
26	MT520310	Automatic Cam Roll Plate	1	
27	MT520320	Automatic Ball Plate	1	
28	MT520350	Nut	1	
29	MT520360	Motor	1	
30	A111100210	Speed Controller Plate	4	PT-3/8”
31	A111300030	Cylinder Micro-switch	2	C01-1A
32	A111300020	Proximity Switch	1	
33	A111400010	Buffer	1	
34	A300100020	Bearing	1	GF-10
35	AB6004ZZ	Ball Bearing	2	6004ZZ
36	AB6015ZZ	Ball Bearing	2	6015ZZ
37	ANM110020	Bearing Nut	1	AN04

Item No	Part Number	Description	Quantity	Remarks
38	AWMF01020	Washer	1	AW04

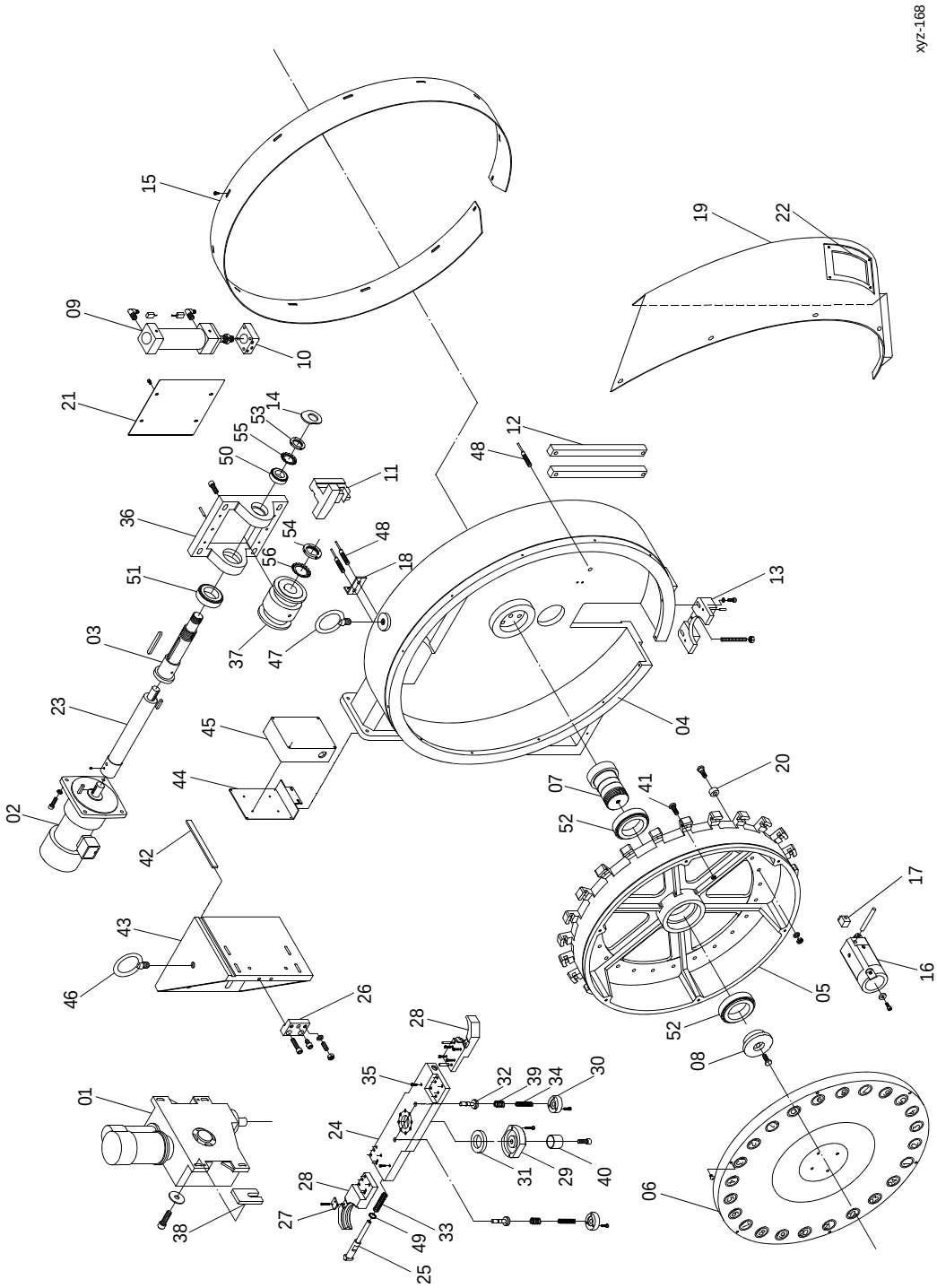


Figure 109 ATC assembly

11.1.8 ATC Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS530010	ATC	1	
2	MS530020	Gear Motor	1	1/4HP-1/2-220V-380V
3	MS530030	Shaft	1	
4	MS530041	Tool Storage	1	
5	MT530050	Pushing	1	
6	MT530060	Dial	1	
7	MS530070	Pot Shaft	1	
8	MS530080	Shaft Cover	1	
9	MS530090	Air Bracket	1	
10	MS530101	Air Bracket	1	
11	MS530111	Supporting Plate	1	
12	MT530120	Connector	2	
13	MS530130	Supporting Plate Bracket	1	
14	MS530140	Sensor	2	
15	MS530151	Protector	1	
16	MT530161	Pot	24	
17	MT530170	Dog	24	
18	MS530180	Sensor Bracket	1	
19	MS530190	ATC Protector	1	
20	MS530200	Shaft	1	
21	MS530210	Cam Bracket	1	
22	MS530220	ATC protector cover	1	
23	MS530230	Motor Shaft	1	
24	MS530240	Change Tool Arm	1	
25	MS530250	Rod	1	
26	MS530260	Adjust Dog	1	
27	MS530270	Key	2	
28	MS530280	Grappling Hook	2	
29	MS530290	Fixing Plate	1	
30	MS530300	Fixing plate	2	
31	MS530310	Clamp Ring	2	
32	MS530320	Rod	2	
33	MS530330	Spring	2	
34	MS530340	Spring	2	
35	MS530350	Screw	2	
36	MS530360	Cam Bracket	1	
37	MT530370	Pushing Cam	1	

Item No	Part Number	Description	Quantity	Remarks
38	MS530380	Washer	1	
39	MS530390	Spring	2	
40	MS530400	Regulating Ring	1	
41	MS530410	Hone Sensor Bolt	1	
42	MT530420	Key	1	
43	MT530470	Connector Bracket	1	
44	MS530480	Bracket	1	
45	MS530490	Electrical Box	1	
46	A300100040	Bolt	1	M12
47	A300100050	Bolt	1	M20
48	A300100060	Sensor	3	
49	AB1820	Bearing	2	LFB1820
50	AB32005	Bearing	1	32005
51	AB32007	Bearing	1	32007
52	AB6208	Bearing	2	6208
53	ANM115025	Nut	1	M25X1.5
54	ANM115035	Nut	1	M35x1.5
55	AWMF01025	Washer	1	M25
56	AWMF01035	Washer	1	M35

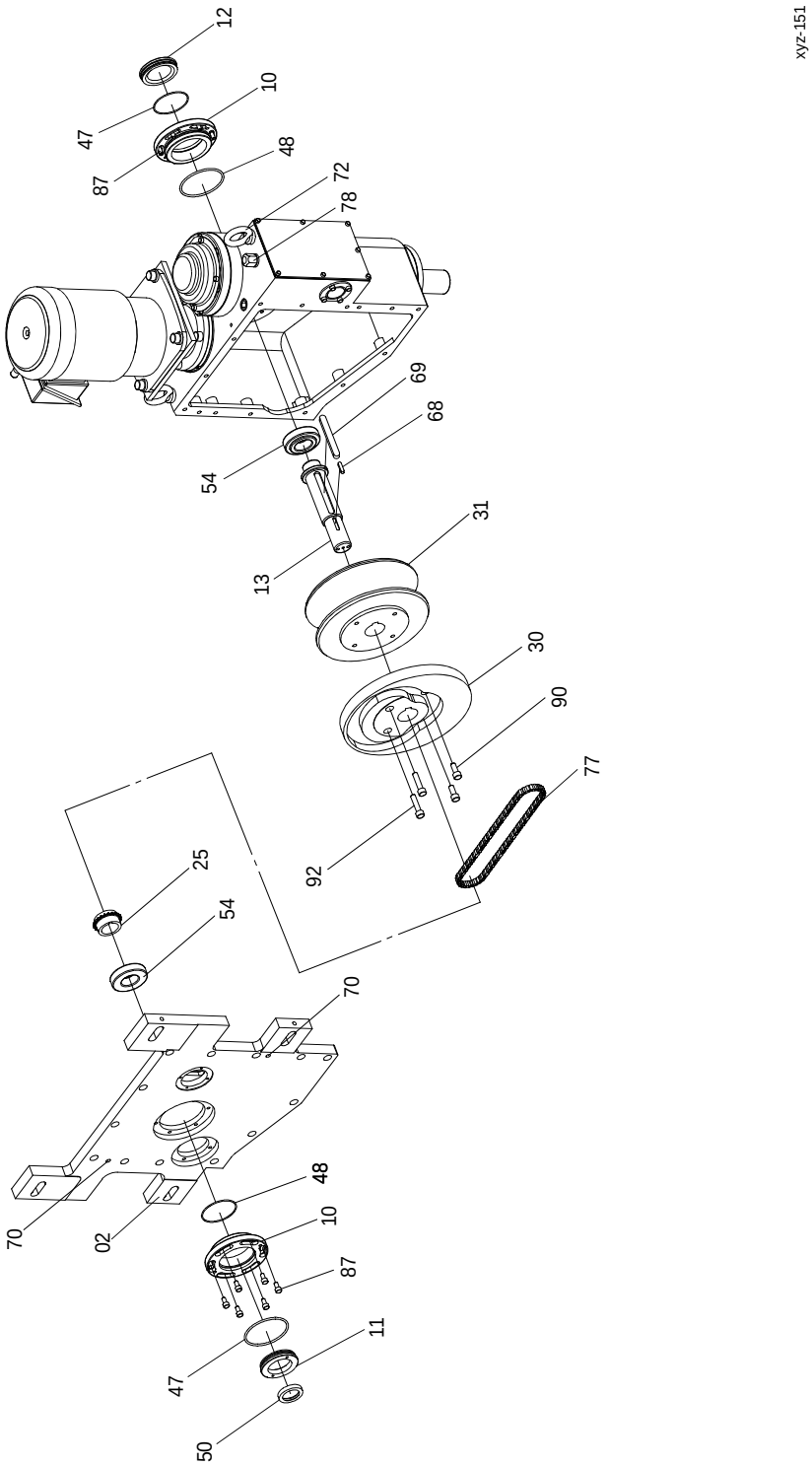


Figure 110 ATC cam box assembly

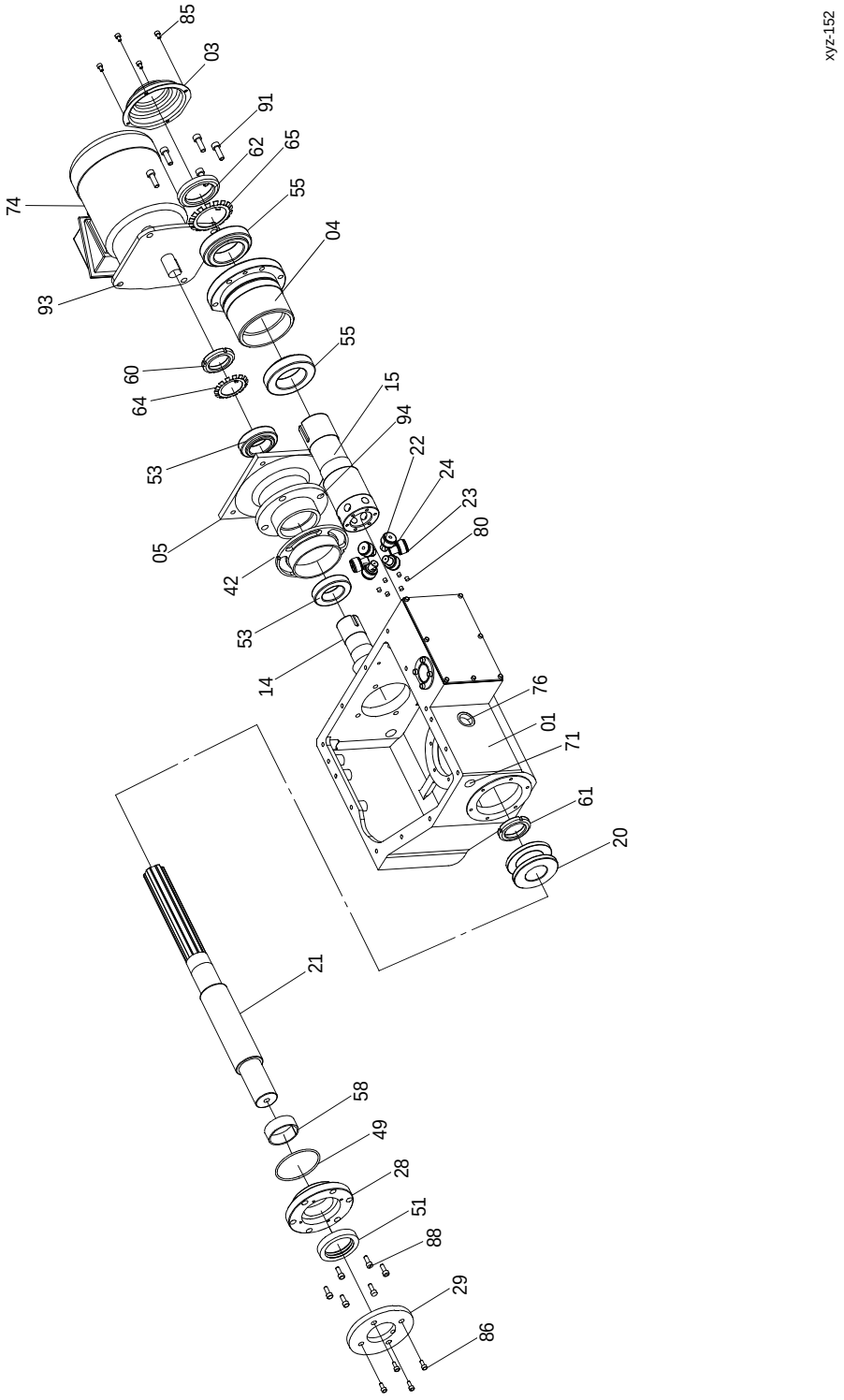


Figure 111 ATC cam box assembly

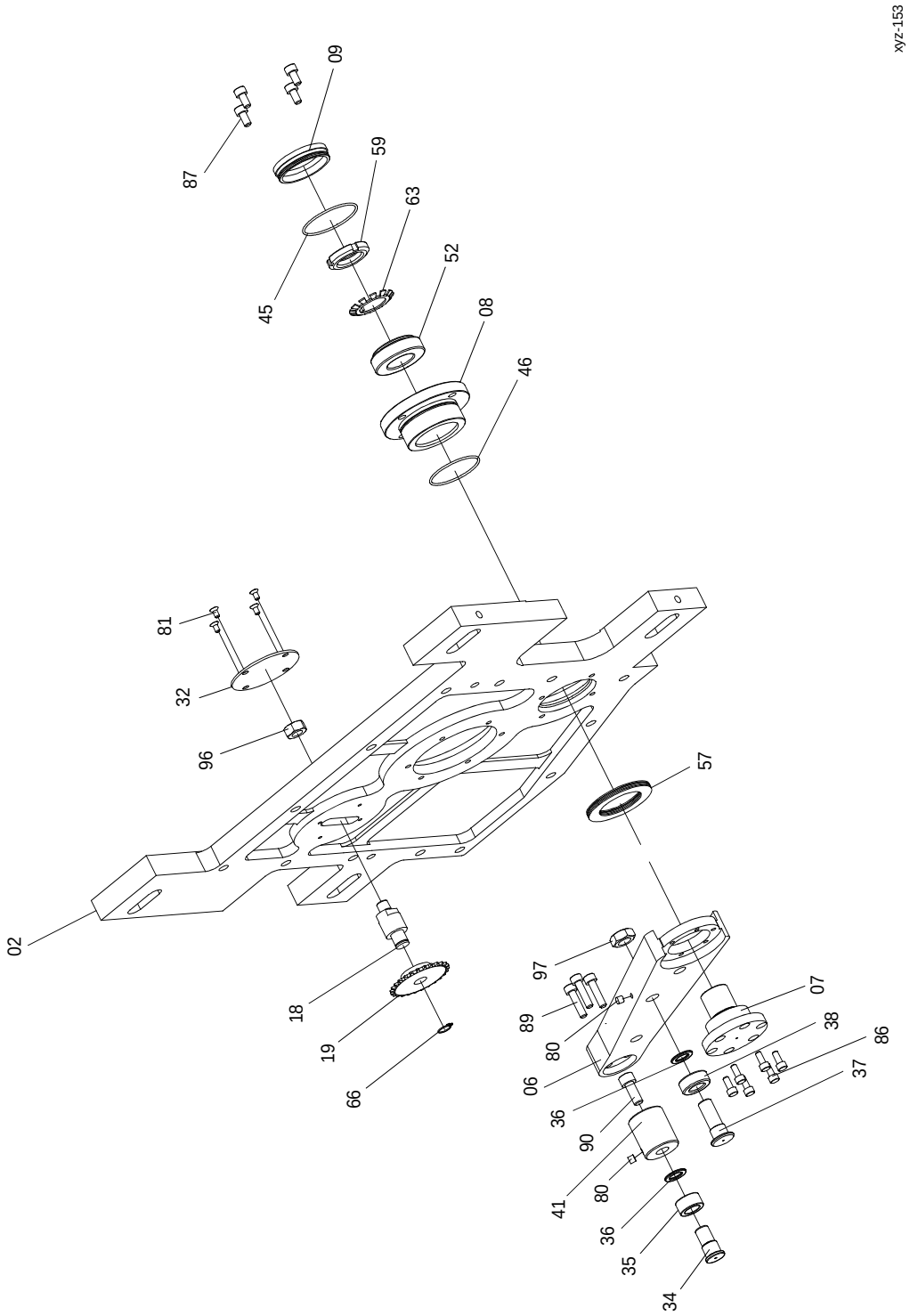


Figure 112 ATC cam box assembly

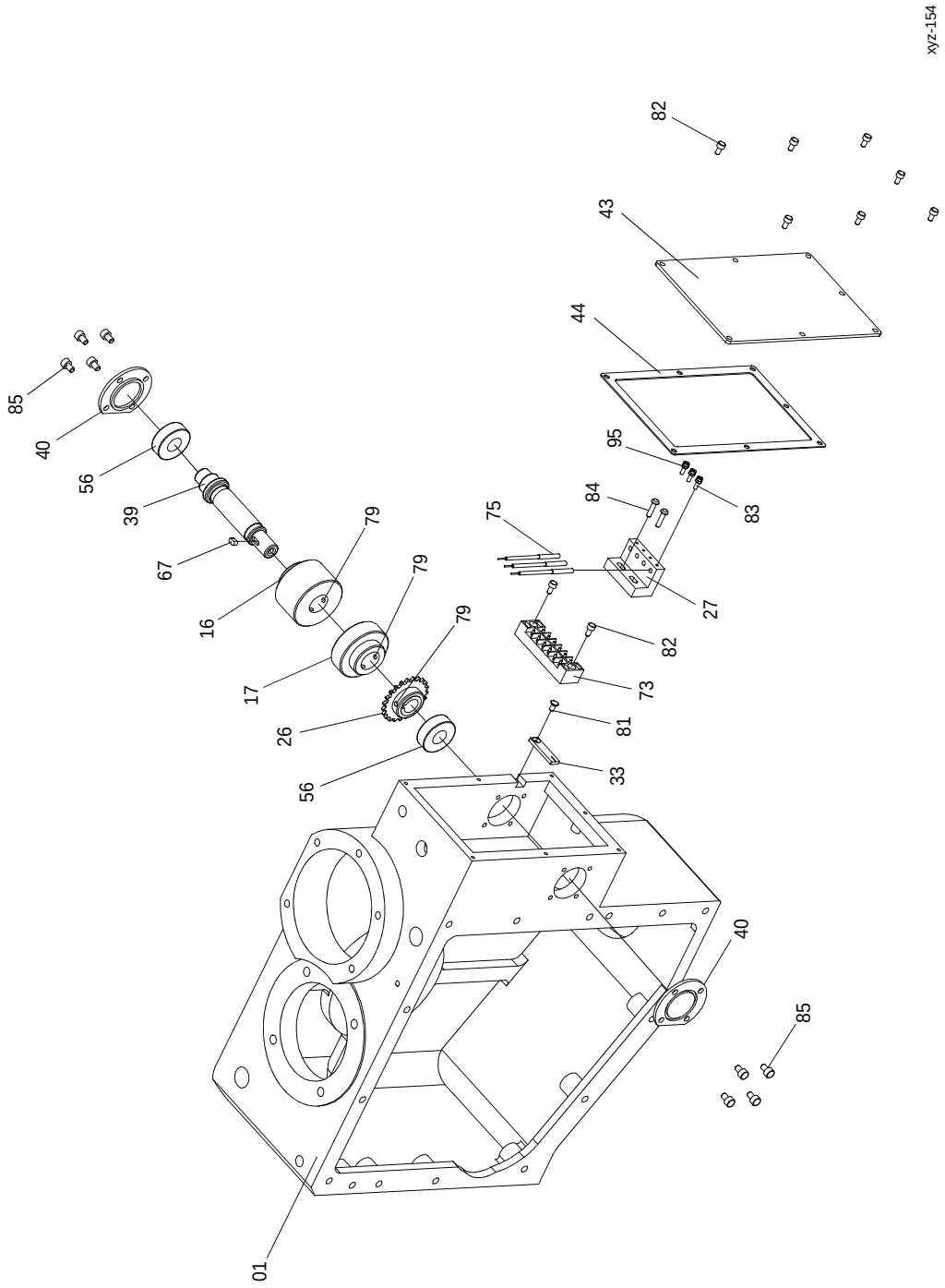


Figure 113 ATC cam box assembly

11.1.9 ATC Cam Box Assembly

Item No	Part Number	Description	Quantity	Remarks
1	A01-001	Cam Box	1	
2	A01-002	Box Cover	1	
3	A01-003	Cover	1	
4	A01-004	Bearing Bracket	1	
5	A01-005	Motor Bracket	1	
6	A01-006	Move Arm	1	
7	A01-007	Arm Shaft	1	
8	A01-008	Arm Bracket	1	
9	A01-009	Cover	1	
10	A01-010	Bearing Bracket	2	
11	A01-011	Cover	1	
12	A01-012	Cover	1	
13	A01-013	Cam Shaft	1	
14	A01-014	Driving Gear	1	
15	A01-015	Turret	1	
16	A01-016	Checking Dog	1	
17	A01-017	Braking Dog	1	
18	A01-018	Idle Wheel Shaft	1	
19	A01-019	Idle Wheel	1	
20	A01-020	Fork	1	
21	A01-021	Spline Shaft	1	
22	A01-022	Bearing	6	
23	A01-122	Ring	6	
24	A01-222	Washer	6	
25	A01-023	Chain Wheel	1	
26	A01-024	Chain Wheel	1	
27	A01-025	Proximity Switch Holder	1	
28	A01-026	Shaft Bracket	1	
29	A01-027	Flange	1	
30	A01-028	Plate Cam	1	
31	A01-029	Roller Gear Cam	1	
32	A01-031	Cover	1	
33	A01-032	Position Indicator	1	
34	A01-033	Bearing	1	
35	A01-133	Ring	1	
36	A01-233	Washer	2	
37	A01-034	Bearing	1	

Item No	Part Number	Description	Quantity	Remarks
38	A01-134	Ring	1	
39	A01-035	Dog Shaft	1	
40	A01-036	Cover	2	
41	A01-037	Needle Bearing Holder	1	
42	A01-038	Adjusting Ring	1	
43	A01-040	Cover	1	
44	A01-052	Rubber Seal	1	
45		O Ring	1	AS031
46		O Ring	1	AS033
47		O Ring	2	AS035
48		O Ring	2	G75
49		O Ring	1	G80
50		Oil Seal	1	TC 30427
51		Oil Seal	1	TB4 507212
52		Roller Bearing	1	32005
53		Roller Bearing	1	32008
54		Roller Bearing	2	30206
55		Roller Bearing	2	32011
56		Ball Bearing	2	6202ZZ
57		Thrust Bearing	1	NTB40603
58		Bearing	1	LBB5020
59		Locking Nut	1	AN05
60		Locking Nut	1	AN08
61		Locking Nut	1	AN08(with set screws)
62		Locking Nut	2	AN11
63		Washer	1	AW05
64		Washer	1	AW08
65		Washer	1	AW11
66		C Ring	1	S12
67		Key	1	4x8x4mm
68		Key	1	5x20x5mm
69		Key	1	10x85x8mm
70		Taper Pins	2	#6x38L
71		Oil Plug	2	1/2” 10L
72		Hook Ring	2	M12
73		Terminal Block	1	6P
74		Motor	1	3/4HP
75		Sensor	3	E2E-CR8B1

Item No	Part Number	Description	Quantity	Remarks
76		Oil Gauge	1	
77		Chain	1	RS25x597L(94)
78		Cable Gland	1	M16x1.5
79		Set Screw	5	M5x6
80		Set Screw	14	M6x5
81		Screw	5	M4x6
82		Screw	9	M4x8
83		Screw	4	M3x10
84		Screw	2	M4x16
85		Screw	12	M5x8
86		Screw	10	M5x12
87		Screw	16	M6x12
88		Screw	6	M6x16
89		Screw	3	M6x25
90		Screw	3	M8x20
91		Screw	18	M8x25
92		Screw	2	M8x35
93		Screw	4	M10x25
94		Screw	4	M10x30
95		Nut	4	M3xP0.5
96		Nut	1	M10xP1.25
97		Nut	1	M12xP1.5

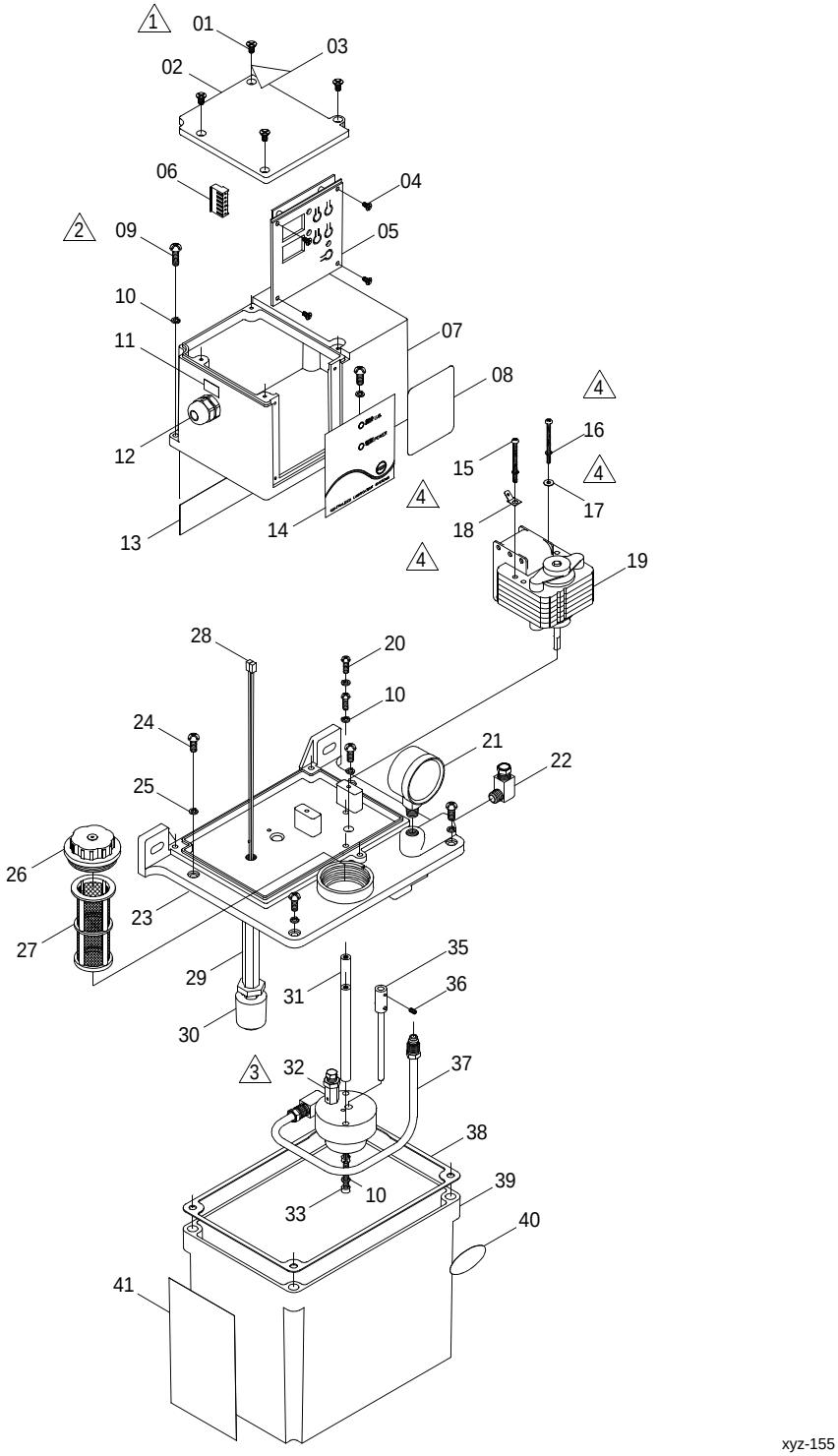


Figure 114 Lubricator assembly

11.1.10 Lubricator Assembly

Item No	Part Number	Description	Quantity	Remarks
1	136007	Cross Recess Head Screw	4	M4x12L
2	155023-MA	Top Cover	1	YET-3.1
3	190104	Sticker	1	
4	136006	Self Tapping Screw	4	M3x6L
5	300031	IC Board	1	YET-C 110V/220V
6	341204	Terminal Bond	1	VH-6P
7	155026-SE	Oil Box (Top)	1	Ø16.without Bu
8	190114	Sticker (CE)	1	YET-C1
9	130348	Button Head Cap Screw	3	M4x15L
10	124603	Spring Washer	7	Ø4
11	190004A	Sticker (110V)	1	110V
	190004B	Sticker (120V)	1	220V
12	340600	Super Gland	1	Ø16(Ø9)
13	190101	Sticker	1	8P
14	190107	Panel Sticker	1	YET-C
15	130347	Button Head Cap Screw	2	M4x50L
16	124603	Spring Washer	2	Ø4
17	124202	Washer	1	
18	340013	PC Board Terminal	1	4.75x0.5t(Ø4.3)
19	400100	Lubrication Motor	1	30t.110V
20	130317	Button Head Cap Screw	2	M4x30L
21	327200	Pressure Gauge	1	15kgxPT1/8x1.5”
22	PH-0401-A-SE	Elbow Adapter	1	Ø4x1/8
23	151033-SE	Top Cover (YET-3L)	1	
24	130321	Button Head Cap Screw	4	M5x12L
25	124601	Spring Washer	4	3/16
26	152001	Cap (Yellow)	1	
27	153000	Oil Filter	1	YAE 40
28	340007-000	Terminal Post	2	JST3.96(VH)
29	YES027	Straight Adapter	1	95mm(2L)
30	321002	Adapter Switch	1	
31	YES041	Branch Pipe	2	
32	401004	Gear Pump	1	
33	132017	Hexagon Socket Cap Hd Screw	2	M4x25L
34				
35	200027	Transmission Shaft	1	YET

Item No	Part Number	Description	Quantity	Remarks
36	133004	Socket Headless Set Screw	1	M3x6L
37	YET020	Aluminium Pipe	1	Ø6x270mm
38	170001	Oil Seal	1	3L
39	162002-SE	Oil Box	1	3L
40	190103	Sticker (ISO-9002)	1	
41	190141	Sticker (Operation Note)	1	YET-C1P2/C2P2

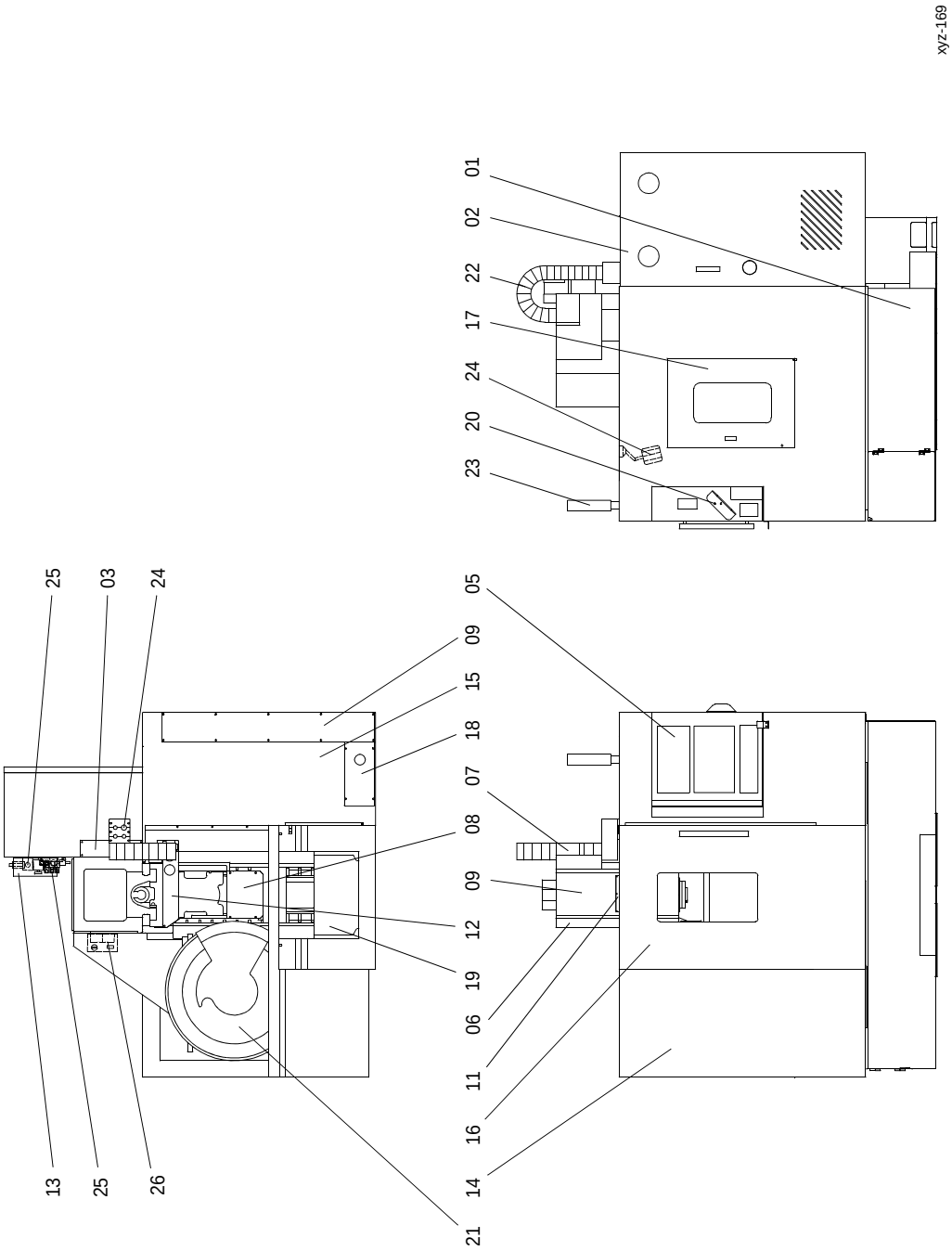


Figure 115 Guard assembly

11.1.11 Guard Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MT360050	Rear Cover	1	
2	MT410010	Electrical Cabinet	1	2.3m/m
3	MT410010-C	Electrical Cabinet	1	2.3m/m
4	MT410010-D	Cover	1	2.3m/m
5	MT410030	Control Box	1	2.3m/m
6	MT420020	Electrical Handwheel Bracket	1	2.3m/m
7	MT420030	Guard	1	2.3m/m
8	MT420040	Guard	1	2.3m/m
9	MT420080	Cover	1	2.3m/m
10	MT420110	Cover	1	2.3m/m
11	MT420110-A	Cover	1	2.3m/m
12	MT420120	Bracket	1	2.3m/m
13	MT430050	Cover	1	2.3m/m
14	MT430190	Left Guard	1	2.3m/m
15	MT430200	Right Guard	1	2.3m/m
16	MT430210	Right Sliding Door	1	2.3m/m
17	MT430240	Left Slide Door	1	2.3m/m
18	MT430250	Cover	1	2.3m/m
19	MT440070	Bracket	1	2.3m/m
20	MS410083	Electrical Handwheel Bracket	1	2.3m/m
21		Tool Carousel	1	
22		Flexible Cable Carrier	1	
23		Lamp	1	
24		Work Light	1	
25		Air Regulator Unit	1	
26		Oil Box	1	
27		Transformer	1	

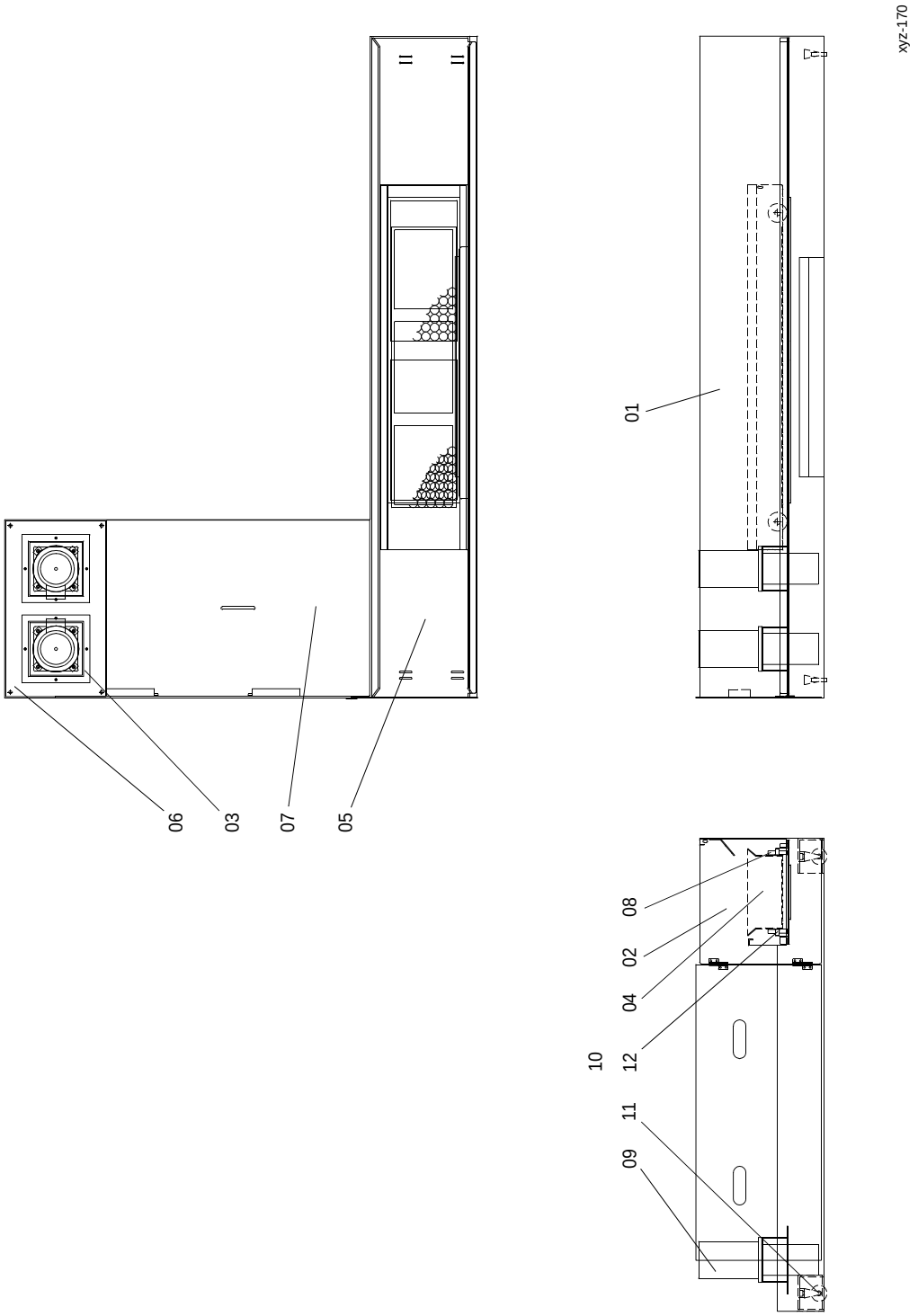


Figure 116 Coolant tank

11.1.12 Coolant Tank

Item No	Part Number	Description	Quantity	Remarks
1	MT360020	Coolant Tank	1	2.0m/m
2	MT360020-A	Side Cover	1	2.3m/m
3	MT360030	Coolant Pump	2	2.3m/m
4	MT360040	Chip Car	1	2.3m/m
5	MT360080	Coolant Tank Cover	1	S45C
6	MT360130	Coolant Tank Cover	1	S45C
7	MT360140	Coolant Tank Cover	1	2.3m/m
8	MS360050	Roller	4	2.3m/m
9	MS720030	Coolant Pump	2	2.3m/m
10	MX360040-A	Shaft	4	
11		Wheel	4	
12		Ring	4	

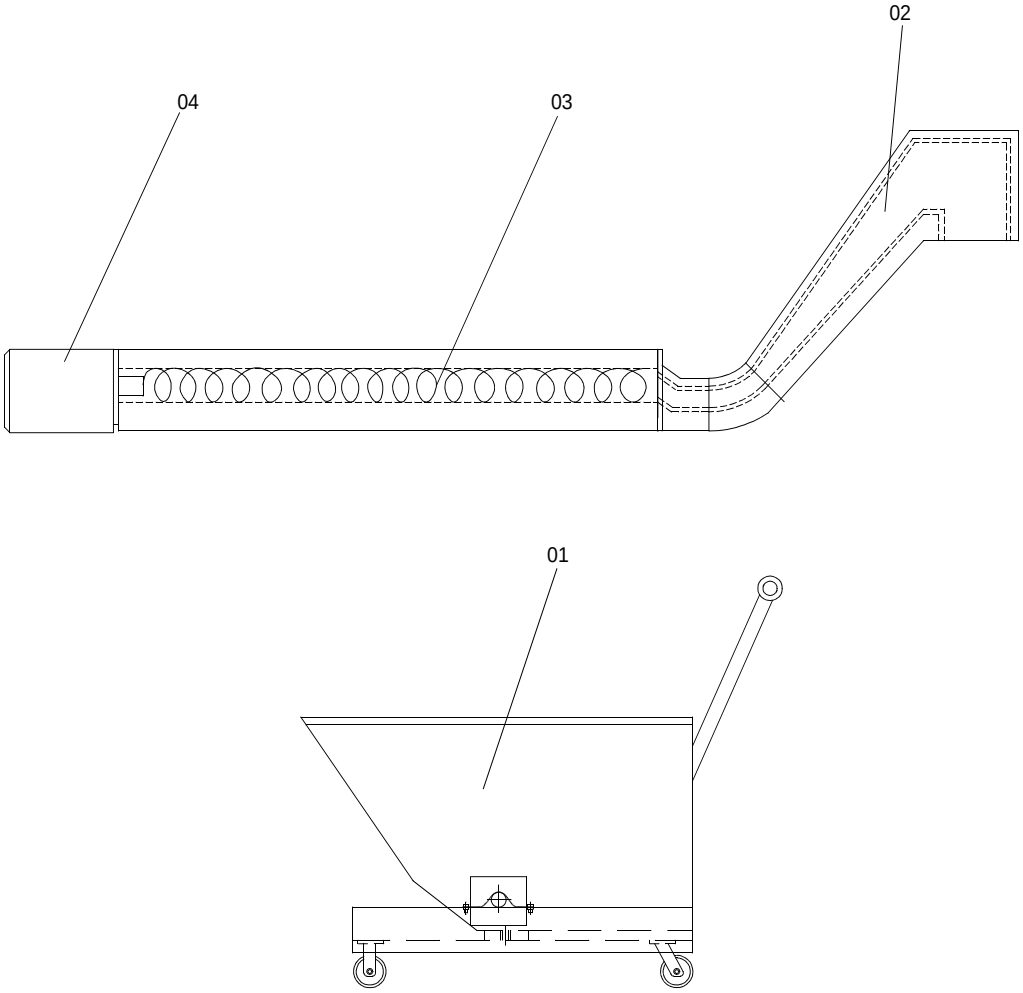


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Figure 117 Chip conveyor

11.1.13 Chip Conveyor

Item No	Part Number	Description	Quantity	Remarks
1	MT450010	Chip Car	1	
2	MT460010	Chip Conveyor	1	
3	MT460020	Screw	1	
4	MT460120	Motor	1	

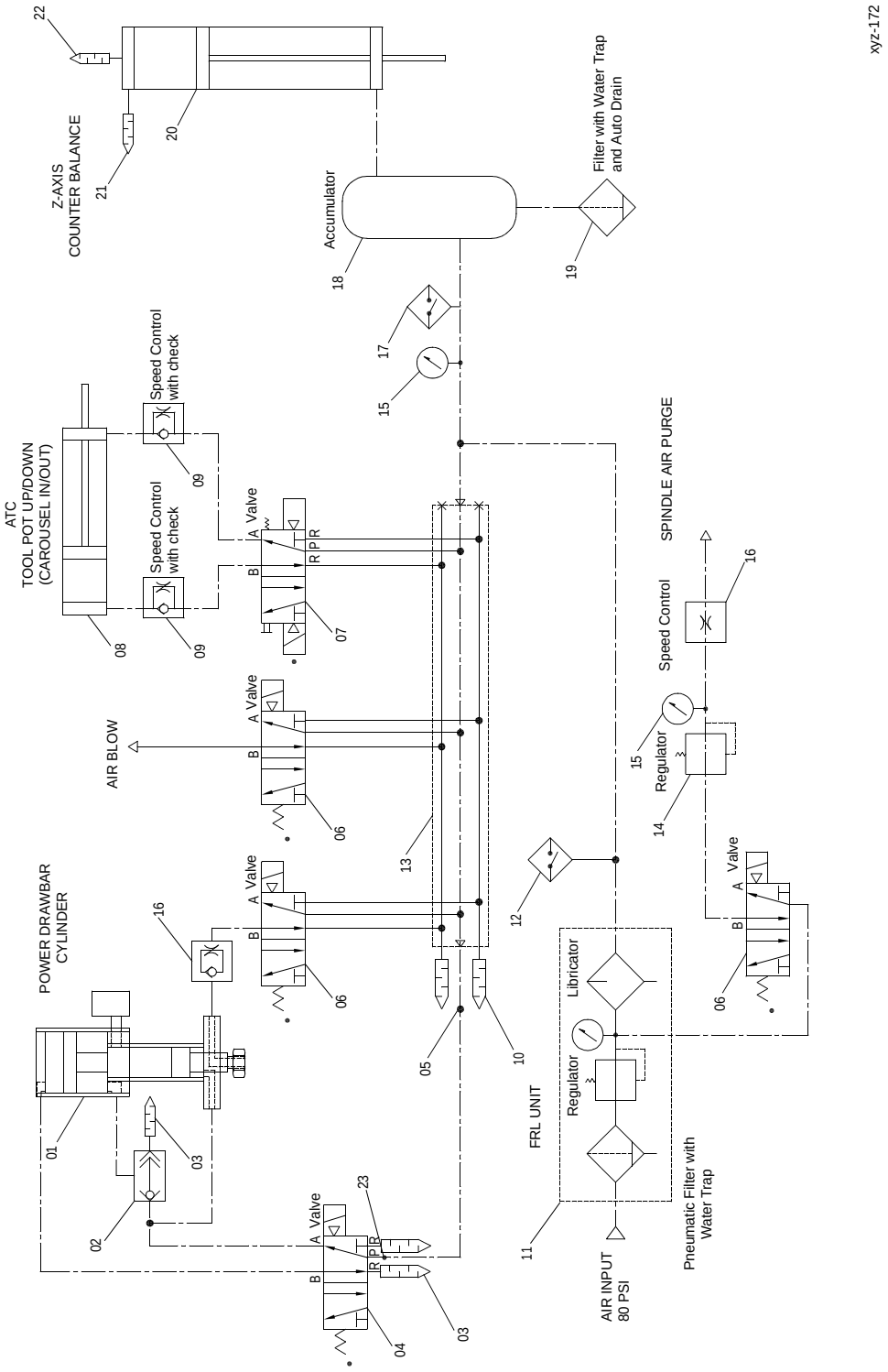

Figure 118 Pneumatic assembly

11.1.14 Pneumatic Assembly

Item No	Part Number	Description	Quantity	Remarks
1	MS010300	Air Unclamping Cylinder	1	
2	A110500010	Quick Exhaust Valve	1	QE-03
3	A111200010	Muffler	3	SLT-03
4	A110100011	Solenoid Valve	1	MVSC-300-4E1
5	A111000010	Solenoid Coil 24VDC 3W SHAKO	1	UFR/L02,03
6	A110100010	Solenoid Valve SHAKO PU322-02S	2	PU322-02S
7	A110100020	Solenoid Valve SHAKO PU520-029D	1	PU520-029D DC24V
8	MT530090	ARM Type ATC-Pot UP/DOWN Cylinder	1	
9	MT520390	Carousel type ATC-IN/OUT Cylinder	1	
10	A110700010	Speed Control with Check Valve	1	
11	A111200020	Muffler	2	CSL-02 1/4
12	A110200010	FRL Unit SHAKO UFR/L-03	1	UFR/L-03
13	A110600010	Pressure Switch SAGOINOMIYA SNS-110Q020	1	SNS-C110Q020
14	A110100030	Solenoid Manifold	1	MVSA-260-5B3
15	A110800010	Air Regulator	1	MAF300-8A
16	A110300010	Gauge	2	PT1/4 0~10kg
17	A110400010	Speed Control	1	
18	A110600020	Pressure Switch EUROSM 311Q122	1	
19	MT030240	Air Accumulator	1	
20	A110900010	Filter with Automatic Drain	1	GHG-401B
21	MT030210	Air Cylinder MINDMAN MCQV-11-63-560	1	
22	A111200030	Muffler	1	3/8”
23	A111200040	Muffler	1	3/4”
24	A111100100	Joint 90°	1	PT3/8”

11.2 Rotary Type Tool Changer Parts List

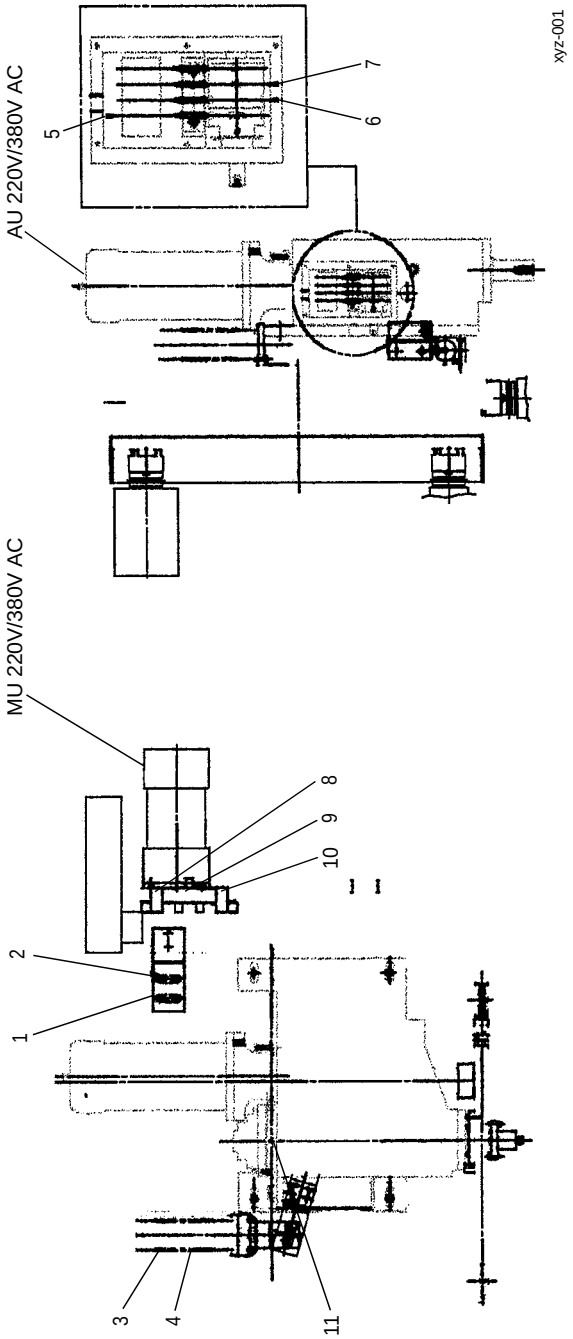

Figure 119 Tool magazine transmission

11.2.1 Tool Magazine Transmission

Item No	Part Number	Description	Quantity	Remarks
MU		Indexing Motor Mechanism	1	1/4 HP 220 V/380 V 1:20 0.2 KW
AU		Tool Change Motor Mechanism	1	1/2 HP 220 V/380 V 1:10 0.37 KW
1	TS12-02P-1	Sensor Switch 1	1	Counting signal of tool mechanism
2	TS12-02P-1	Sensor Switch 2	1	Positioning signal of tool mechanism
3	SC-100	Reaction Switch 1	1	Pocket Down Pos L.S.
4	SC-100	Reaction Switch 2	1	Pocket Up Pos L.S.
5	E2E-CR8B1	Sensor Switch 3	1	Motor stopping signal of tool mechanism
6	E2E-CR8B1	Sensor Switch 4	1	Tool change mechanism's tool clamping confirmation signal
7	E2E-CR8B1	Sensor Switch 5	1	Origin confirmation signal of tool change mechanism
8	MVSC2204E2A1	Solenoid Valve 1	1	
9		COM	1	Solenoid valve common point
10	MVSC2204E2A1	Solenoid Valve 2	1	
11	TS12-02P-1	Sensor Switch 6	1	Tool magazine origin

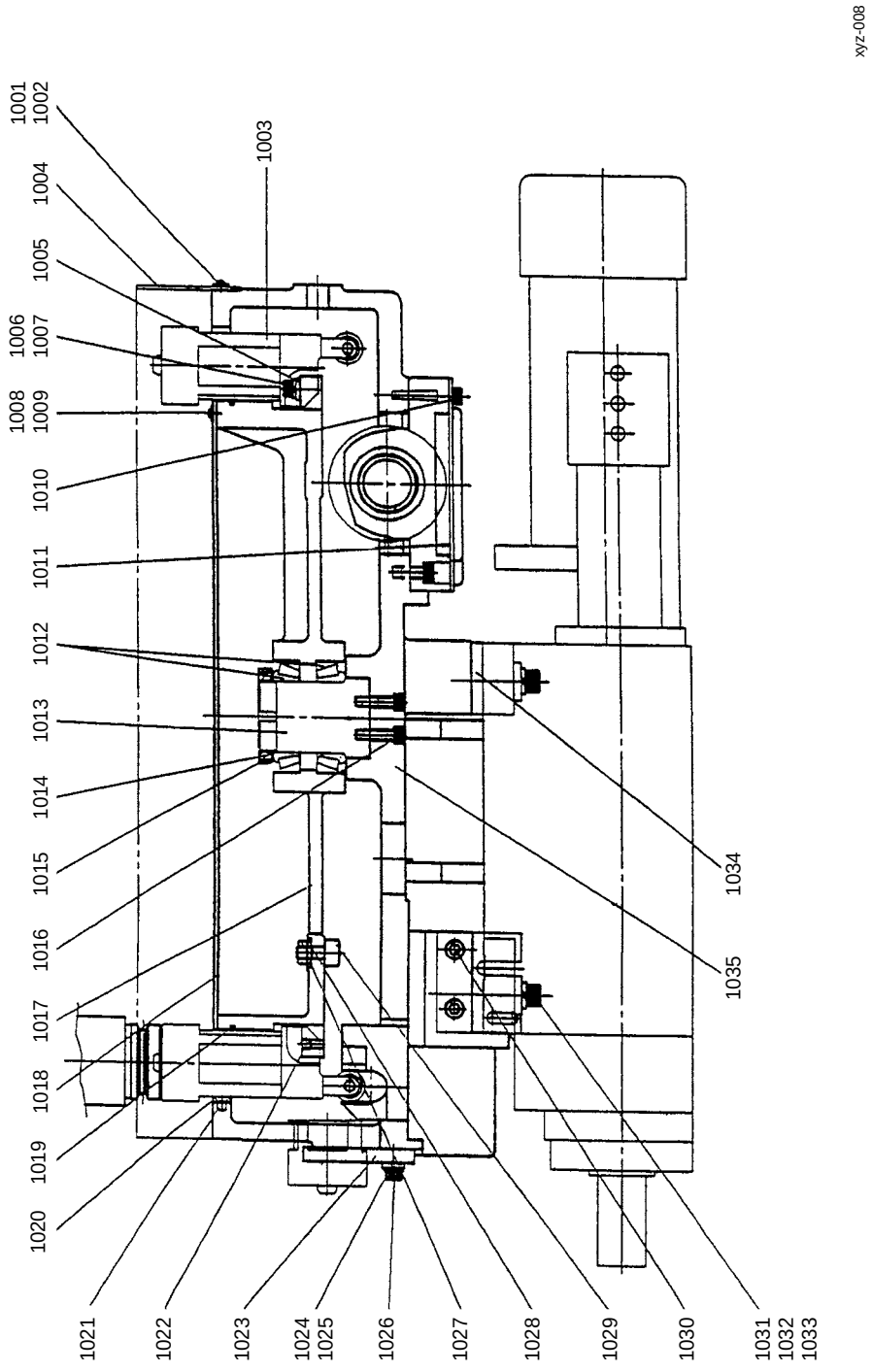

Figure 120 Driving sprocket assembly

11.2.2 Driving Sprocket Assembly

Item No	Part Number	Description	Quantity	Remarks
1001		Round Hexagon Socket Hd Cap Screw	9	M6x10L
1002		Washer	9	M6
1003		Pocket	24	
1004		Protector	1	
1005		Washer	24	SS41
1006		Hexagon Socket Hd Cap Screw	24	M8x20L
1007		Spring Washer	24	M8
1008		Round Hexagon Socket Hd Cap Screw	6	M6x20L
1009		Washer	6	
1010		Hexagon Socket Hd Cap Screw	4	M6x10L
1011		Protector	1	
1012		Taper Roller Bearings	2	32012A
1013		Shaft	1	S45C
1014		Lock Washer	1	AW12
1015		Lock Nut	1	AN12
1016		Hexagon Socket Hd Cap Screw	2	M8x35L
1017		Rotary Disk	1	FC25
1018		Pushing Cap	1	
1019		Rubber Strip	1	Ø4x1680L
1020		Pushing Collar	1	
1021		Hexagon Socket Hd Cap Screw	9	M6x12L
1022		Pocket Shaft	24	
1023		Support Plate Bracket	1	SS41
1024		Hexagon Socket Hd Cap Screw	2	M8x30L
1025		Spring Washer	2	M8
1026		Washer	2	SS41
1027		Hexagon Nut	24	M12
1028		Spring Washer	24	M12
1029		Shaft	24	S45C
1030		Hexagon Socket Hd Cap Screw	2	M10x40L
1031		Hexagon Socket Hd Cap Screw	4	M12x65L
1032		Spring Washer	4	M12
1033		Washer	4	M12
1034		ATC Pad	4	SS41

Item No	Part Number	Description	Quantity	Remarks
1035		Tool Storage	1	FC25

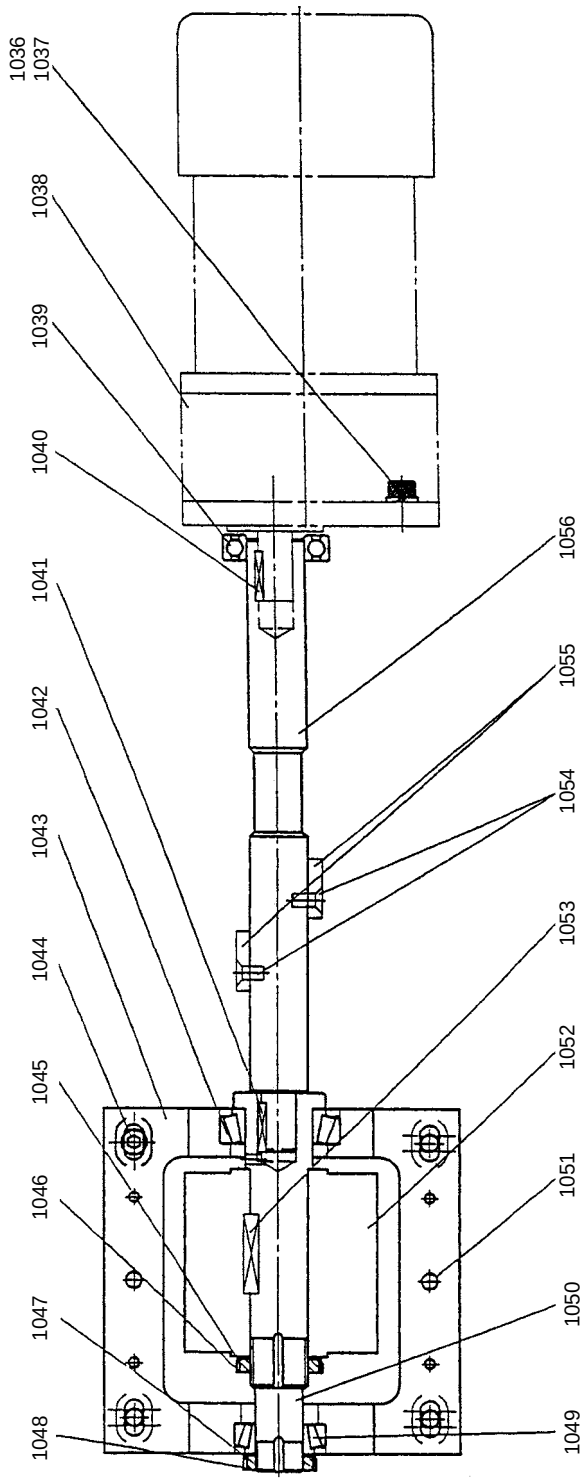

Figure 121 Motor transmission assembly

11.2.3 Motor Transmission Assembly

Item No	Part Number	Description	Quantity	Remarks
1036		Hexagon Socket Hd Cap Screw	4	M8x25L
1037		Spring Washer	4	M8
1038		Gear Motor	1	FME18 1/4 HP 1:20 380 V
1039		Ball Bearing	1	6006 ZZ
1040		Key	1	5x5x25L
1041		Key	1	5x5x25L
1042		Taper Roller Bearings	1	32007A
1043		Bearing Bracket	1	FC25
1044		Hexagon Socket Hd Set Screw	4	M8x25L
1045		Lock Washer	1	AW06
1046		Lock Nut	1	AN06
1047		Lock Washer	1	AW05
1048		Lock Nut	1	AN05
1049		Taper Roller Bearings	1	32005A
1050		Shaft	1	S45C
1051		Taper Pin	2	6x38L
1052		Tube Cam	1	SCM4
1053		Key	1	10x8x40L
1054		Hexagon Socket Hd Cap Screw	2	M6x12L
1055		Sensor	2	SS41
1056		Motor Shaft	1	S45C

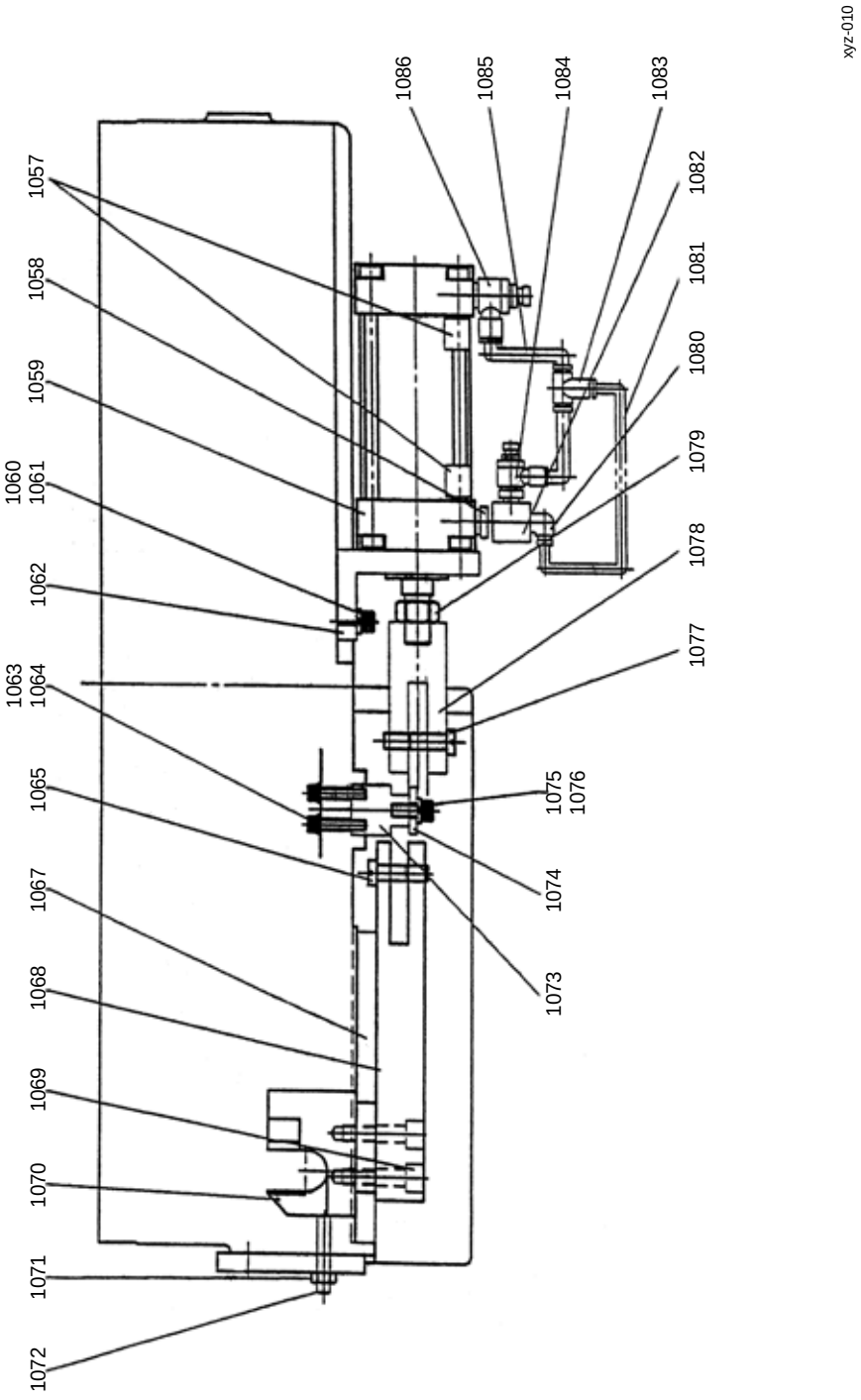

Figure 122 Tool falling cylinder assembly

11.2.4 Tool Falling Cylinder Assembly

Item No	Part Number	Description	Quantity	Remarks
1057		Magnetic Switch	2	FC-12M FC-B8
1058		Bush	1	SPC803
1059		Air Bracket	1	Ø63x85SA Type
1060		Hexagon Socket Hd Cap Screw	2	M8x25L
1061		Spring Washer	2	M8
1062		Air Bracket	1	SS41
1063		Hexagon Socket Hd Cap Screw	2	M6x30L
1064		Spring Washer	2	M6
1065		Shaft	1	S45C
1067		Connector	1	S45C
1068		Connector	1	S45C
1069		Hexagon Socket Hd Cap Screw	2	M10x35L
1070		Support Plate	1	S45C
1071		Hexagon Nut	1	M8
1072		Hexagon Socket Hd Set Screw	1	M8x50L
1073		Support Bracket	1	S45C
1074		Washer	1	SS41
1075		Hexagon Socket Hd Cap Screw	1	M8x20L
1076		Spring Washer	1	
1077		Shaft	1	S45C
1078		Connector	1	S45C
1079		Hexagon Nut	1	M16P105
1080		Joint	1	SPL-6M5
1081		Pu Tube	1	Ø6x40L
1082		Valve	1	PC02
1083		T Type Joint	1	SPE 8x6x8
1084		Adjustable Joint	1	JSC-802
1085		Pu Tube	1	
1086		Adjustable Joint	1	JSC-803

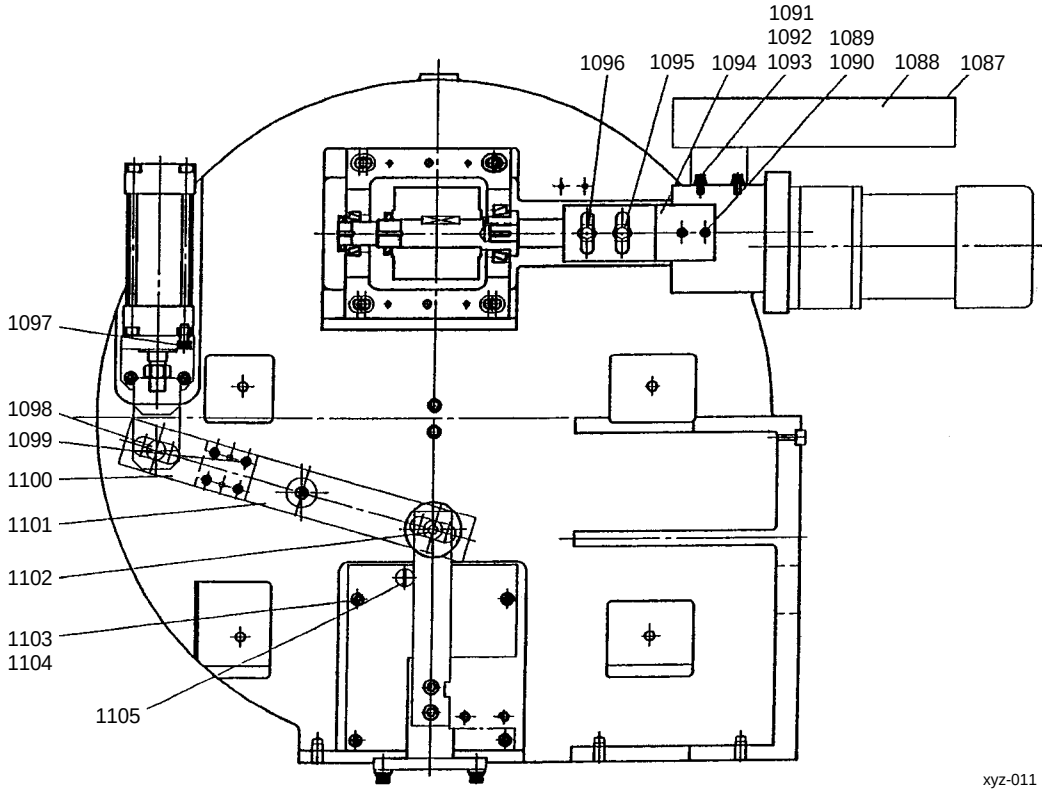

Figure 123 Tool falling guide plate cylinder assembly

11.2.5 Tool Falling Guide Plate Cylinder Assembly

Item No	Part Number	Description	Quantity	Remarks
1087		Pushing Cap	1	SPHC
1088		Box	1	SPHC
1089		Hexagon Socket Hd Cap Screw	2	M6x16L
1091		Hexagon Socket Hd Cap Screw	2	M6x16L
1092		Spring Washer	2	M6
1093		Washer	2	M6
1094		Sensor Bracket	1	SPHC
1095		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO
1096		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO
1097		Hexagon Socket Hd Cap Screw	4	M8x20L
1098		Wheel	1	S45C
1099		Hexagon Socket Hd Cap Screw	4	M6x16L
1100		Connector	1	S45C
1101		Arm	1	S45C
1102		Wheel	1	S45C
1103		Hexagon Socket Hd Cap Screw	4	M8x25L
1104		Spring Washer	4	M8
1105		Shaft	1	S45C

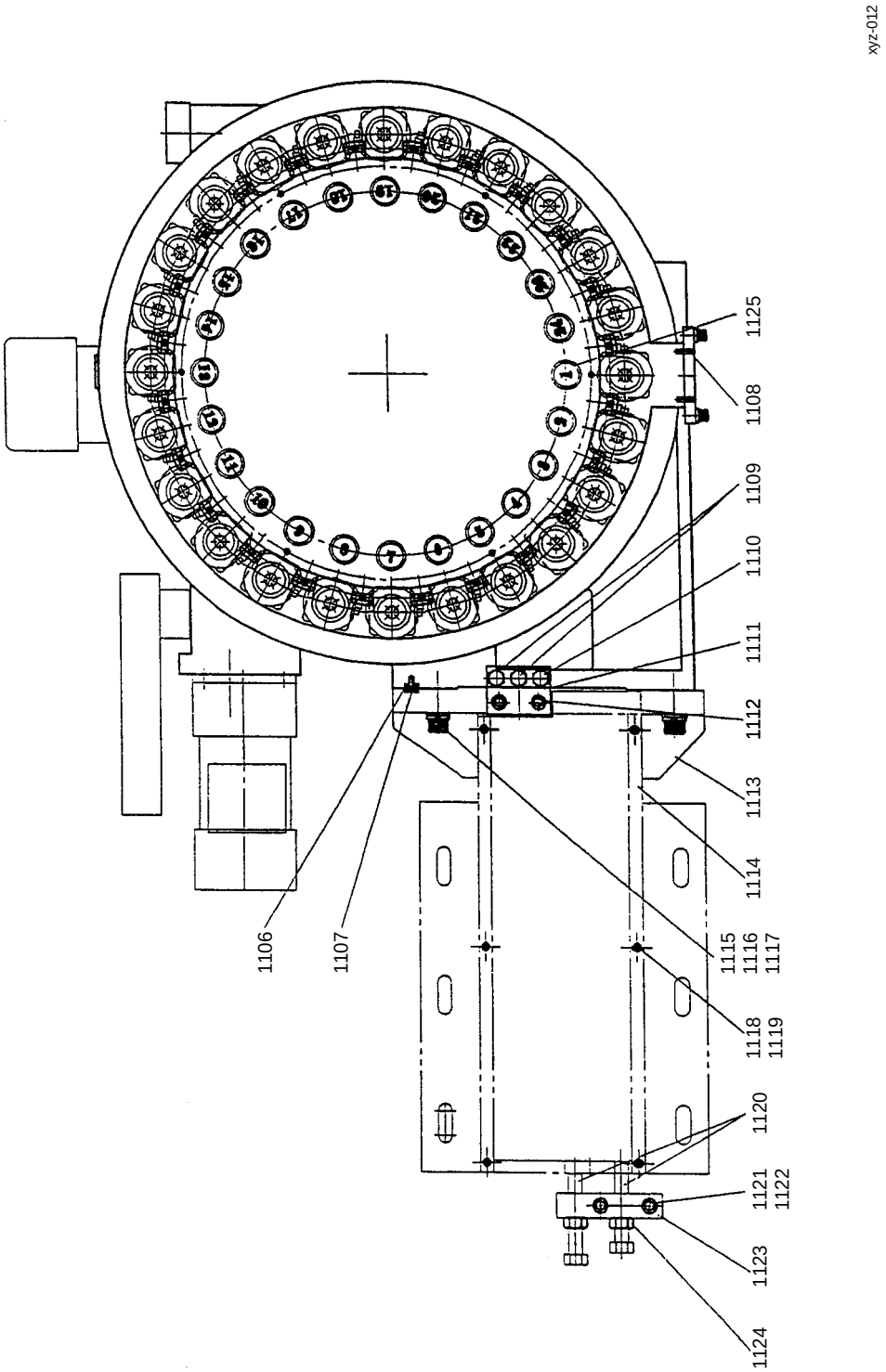

Figure 124 Support block assembly

11.2.6 Support Block Assembly

Item No	Part Number	Description	Quantity	Remarks
1106		Key	2	S45C
1107		Hexagon Socket Hd Cap Screw	2	M6x16L
1108		Pin	2	Ø6x20L
1109		Hexagon Socket Hd Set Screw	3	M12x80L
1110		Hexagon Nut	3	M12
1111		Adjustable	1	S45C
1112		Hexagon Socket Hd Cap Screw	2	M12x30L
1113		Connector Bracket	1	SS41
1114		Pushing Cap	1	SPHC
1115		Hexagon Socket Hd Cap Screw	4	M16x60L
1116		Spring Washer	4	M16
1117		Washer	4	M16
1118		Hexagon Socket Hd Cap Screw	6	M6x10L
1119		Spring Washer	6	M6
1120		Hexagon Screw	2	M16x110L
1121		Hexagon Socket Hd Cap Screw	2	M12x95L
1122		Spring Washer	2	M12
1123		Adjustable Table	1	SS41
1124		Hexagon Nut	2	M16
1125		Pocket	24	

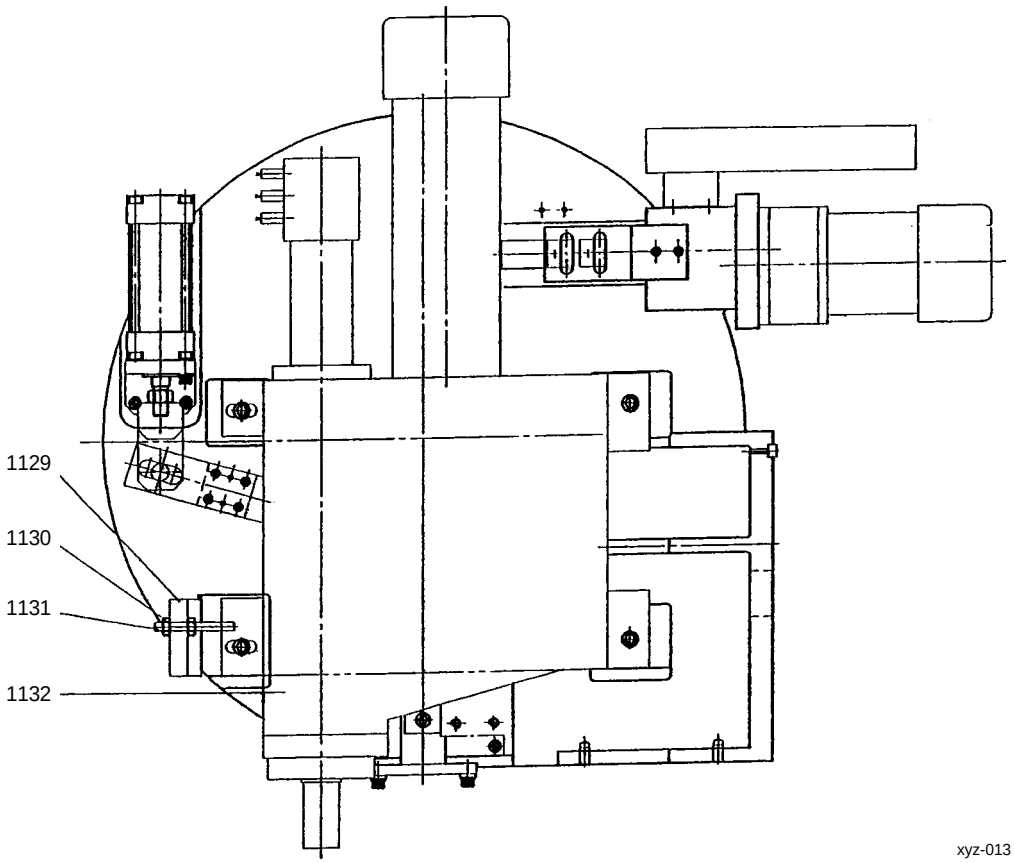

Figure 125 ATC Adjusting block assembly

11.2.7 ATC Adjusting Block Assembly

Item No	Part Number	Description	Quantity	Remarks
1129		Adjustable Table	1	SS41
1130		Hexagon Nut	2	M10
1131		Hexagon Socket Hd Set Screw	1	M10x90L
1132		Automatic Tool Changer	1	

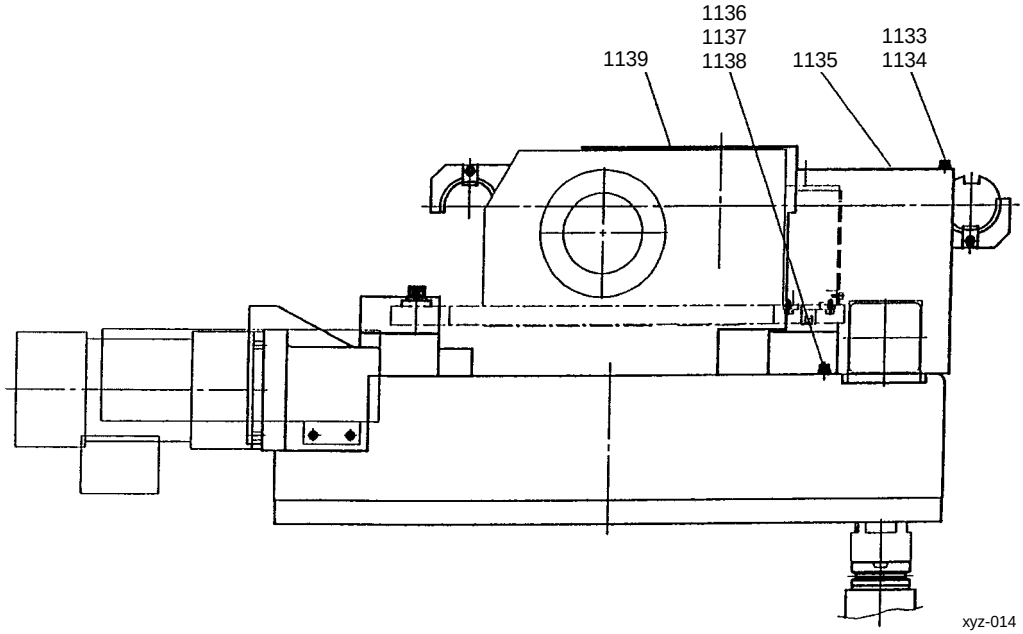

Figure 126 ATC protector assembly

11.2.8 ATC Protector Assembly

Item No	Part Number	Description	Quantity	Remarks
1133		Hexagon Socket Hd Cap Screw	7	M6x10L
1134		Spring Washer	7	M6
1135		Pushing Cap	1	SPHC
1136		Hexagon Socket Hd Cap Screw	5	M6x16L
1137		Spring Washer	5	M6
1138		Washer	5	M6
1139		ATC Protector	1	SPHC

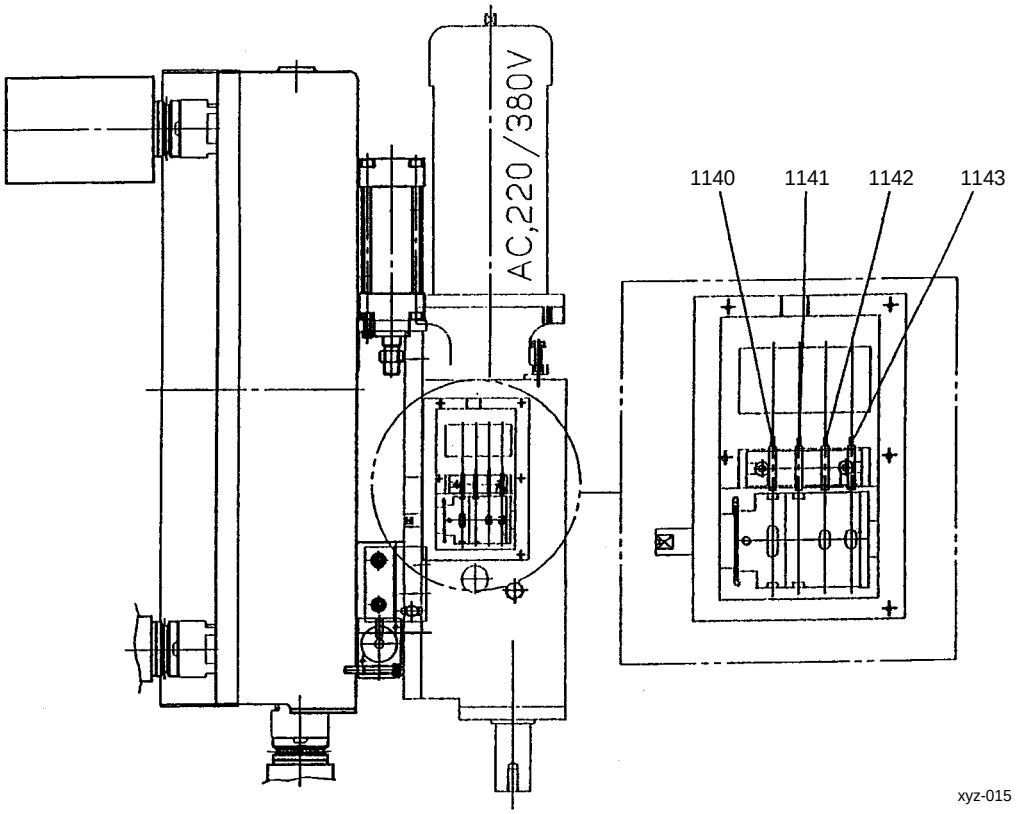

Figure 127 ATC sensor assembly

11.2.9 ATC Sensor Assembly

Item No	Part Number	Description	Quantity	Remarks
1140		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Arm Stop Position
1141		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Tool ClampLU NCL AMF
1142		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Arm Origin
1143		Sensor	1	Schonbuch Electronic IBDA0414 PNP NO Arm Detector

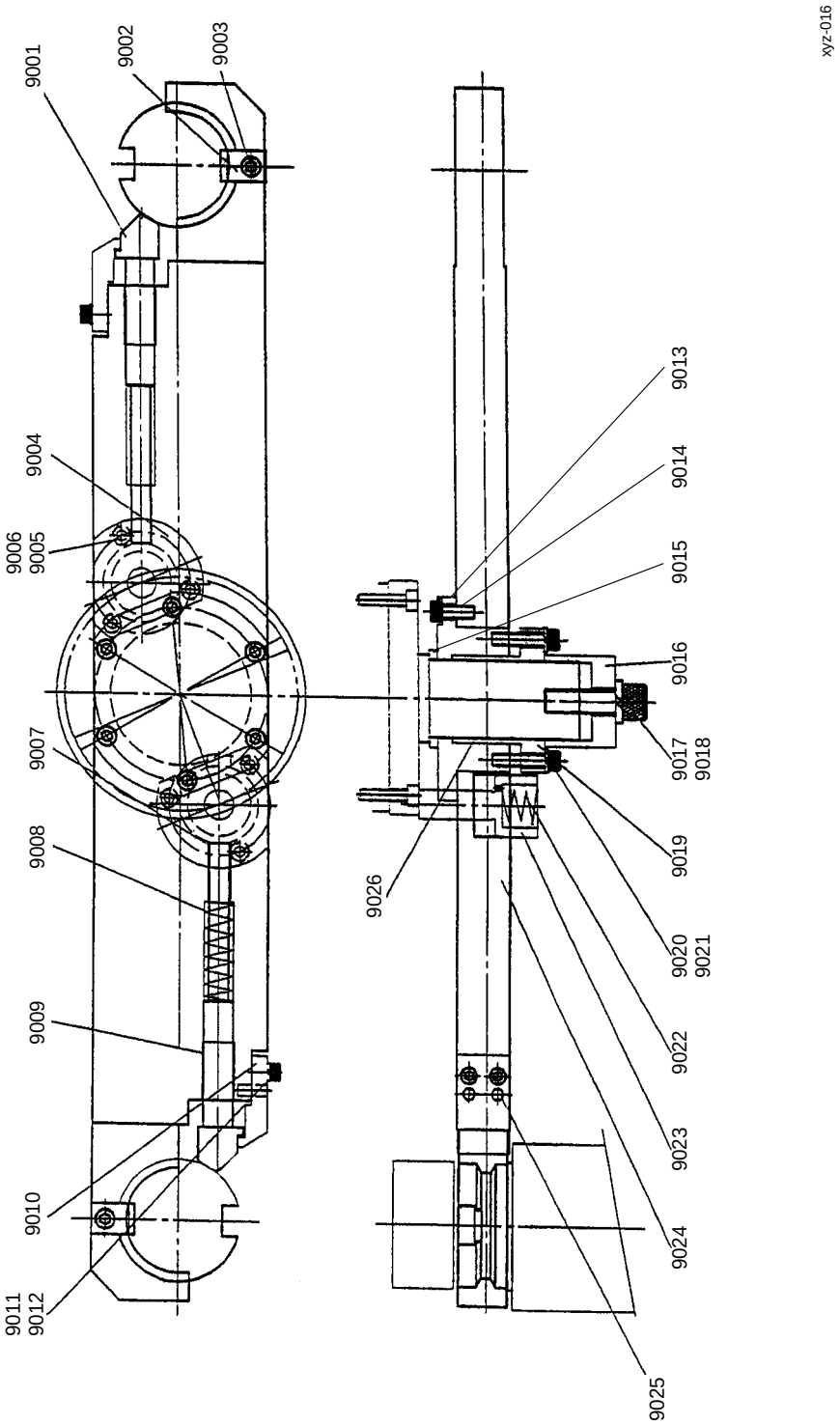

Figure 128 Tool change arm assembly

11.2.10 Tool Change Arm Assembly

Item No	Part Number	Description	Quantity	Remarks
9001		Rod	2	SKD11
9002		Block	2	S45C
9003		Round Hexagon Socket Hd Cap Screw	2	M6x10
9004		Fixing Plate	2	S45C
9005		Cap Bolt	6	M6x25
9006		Spring Washer	6	M6
9007		Bushing	2	LFB1010
9008			2	
9009		Bushing	4	LFB1515
9010		Lock Block	2	S45C
9011		Cap Bolt	4	M5x16
9012		Spring Washer	4	M5
9013		Fixing Plate	1	S45C
9014		Cap Bolt	6	M6x16
9015		Adjusting Plate	1	S45C
9016		Adjusting Ring	1	S45C
9017		Cap Bolt	1	M12x40
9018		Spring Washer	1	M12
9019		Adjusting Ring	1	S45C
9020		Cap Bolt	6	M6x30
9021		Spring Washer	6	M6
9022		Spring	2	
9023		Rod	2	SKD11
9024		Tool Change Arm	1	S45C
9025		Gib	4	Ø6x12
9026		Clamp Ring	3	SCE 4045

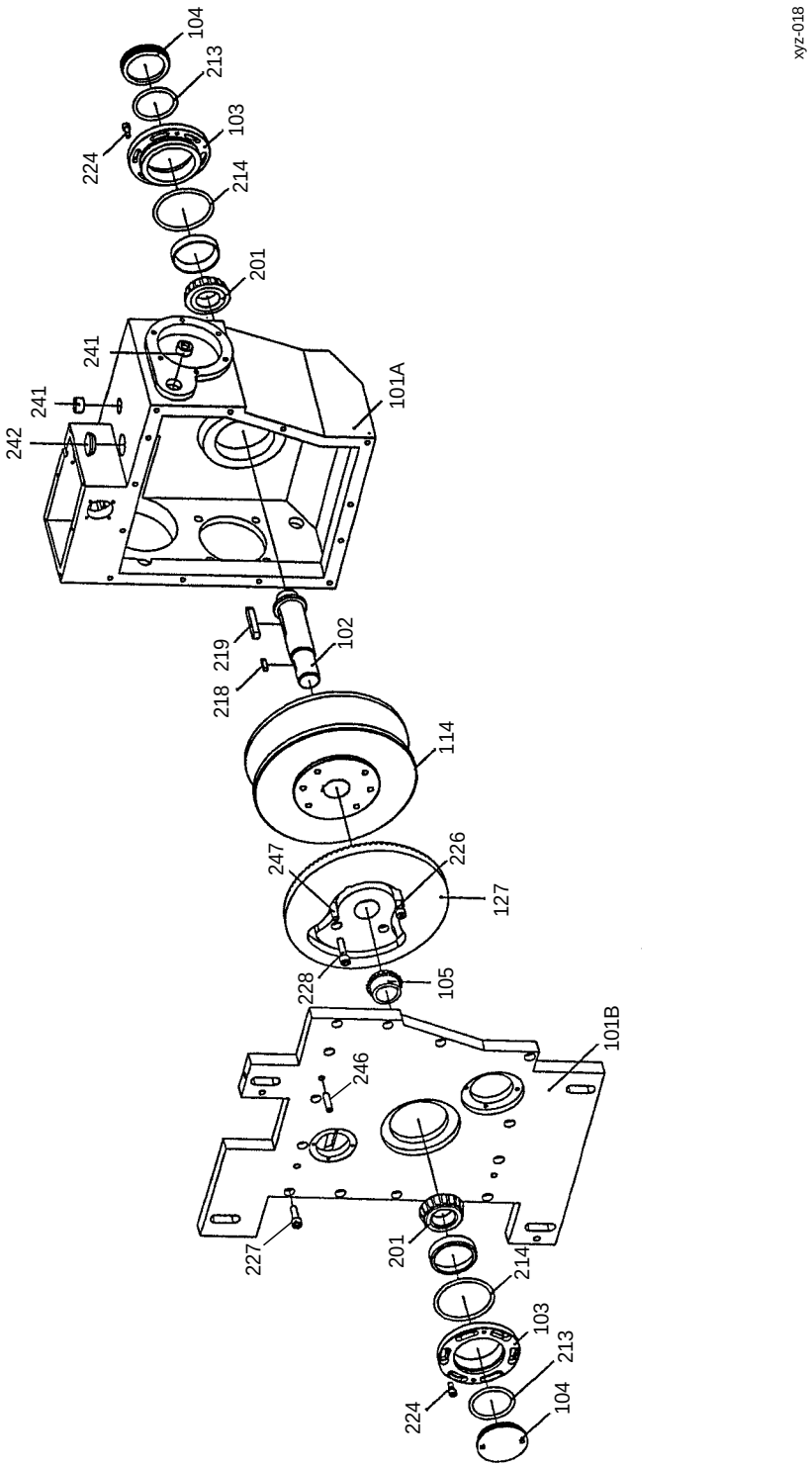

Figure 129 Input shaft

11.2.11 Input Shaft

Item No	Part Number	Description	Quantity	Remarks
101A	A4020SC000A1	Case	1	
101B	A4020SC000B1	Case Cap	1	
102	A402A0100001	Cam Shaft	1	
103	A402A0200001	Tuneup Cap	2	
104	A402A0300001	Tuneup Screw Cap	2	
105	A402A0400001	Cam Shaft Sprocket	1	
114	A402C0100000	Cam	1	
127	A402F0100001	Big Umbrella Gear	1	
201	HR30206	Tapered Roller Bearing	2	
213	O-55x2	O ring	2	Ø55x2
214	G75	O ring	2	
218	DFK5x5x20	Double Circle Key	1	5x5x20
219	DFK10x8x55	Double Circle Key	1	10x8x55
224	HI-M6x16L	Inside Hexagonal Screw	12	M6x16L
226	HI-M8x20L	Inside Hexagonal Screw	2	M8x20L
227	HI-M8x25L	Inside Hexagonal Screw	13	M8x25L
228	HI-M8x35L	Inside Hexagonal Screw	2	M8x35L
241	PT1/2”	Oil Plugger	4	PT1/2”
242	OI-28	Oil Plugger	1	Ø28 mm
246	PIN-T-8x32L	Taper Pin	3	8x32L (1:50)
247	PIN-P-8x30L	Parallelism Pin	2	Ø8x30L

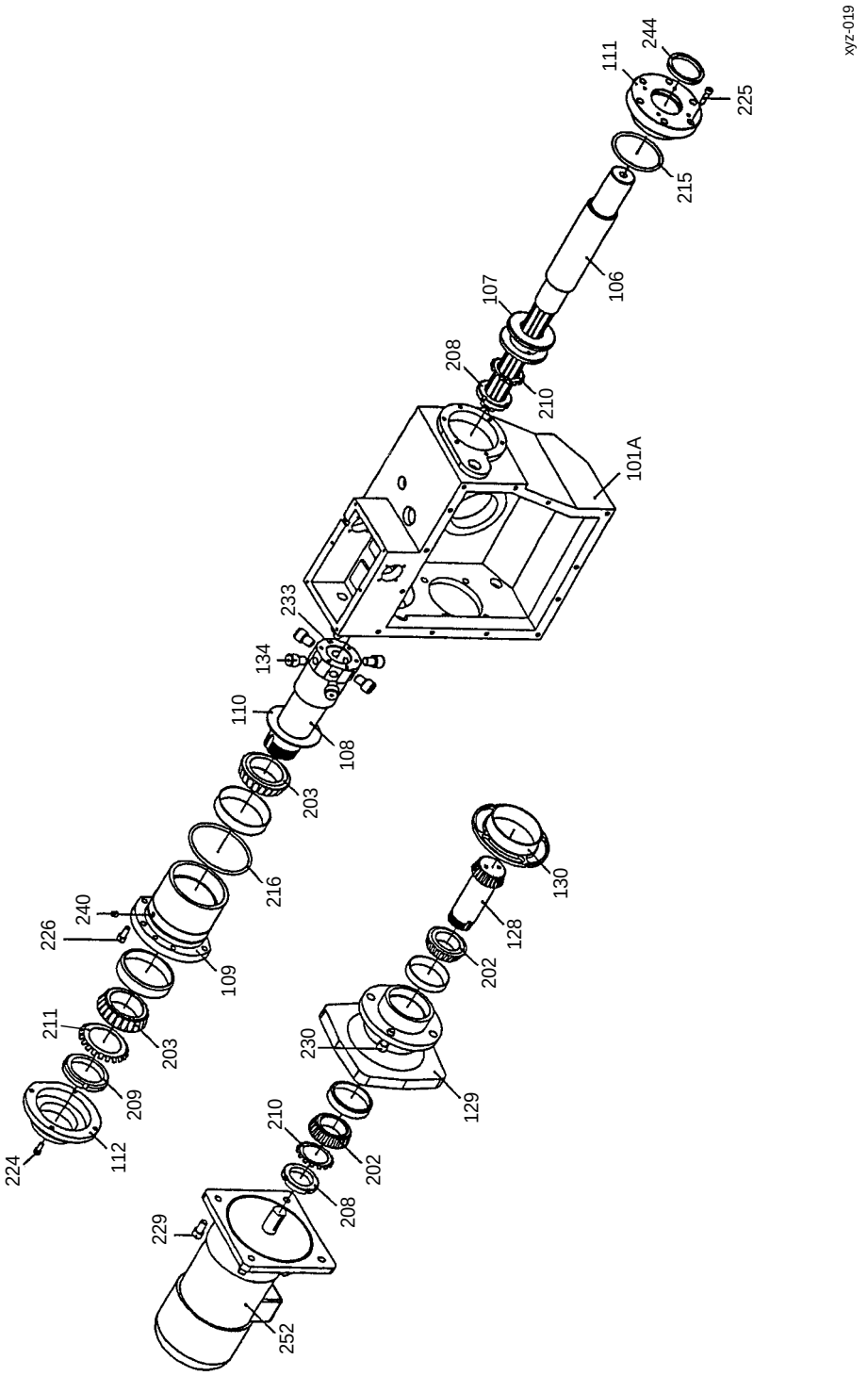

Figure 130 Output shaft

11.2.12 Output Shaft

Item No	Part Number	Description	Quantity	Remarks
101A	A4020SC000A1	Case	1	
106	A402B0100001	Spline (Output) Shaft	1	
107	A402B0200001	Transmit Wheel	1	
108	A402B0300001	Bearings Tube	1	
109	A402B0400001	Bearings Tube Fixture	1	
110	A402B0500001	Bearings Tube Gasket	1	
111	A402B0600001	Front Fix Cap	1	
112	A402B0900001	Back Fix Cap	1	
128	A402F0200001	Small Umbrella Gear	1	
129	A402F0300001	Motor Fixture	2	
130	A402F0900001	Adjustment Sheet	1	
134	RB00020000A1	Bearing	6	Ø20
202	HR32008	Tapered Roller Bearing	2	
203	HR32011	Tapered Roller Bearing	2	
208	AN08	Sun's Unit	1	
209	AN11	Sun's Unit	1	
210	AW08	Sun's Gasket	1	
211	AW11	Sun's Gasket	1	
215	G80	O ring	1	
216	G100	O ring	1	
224	HI-M6x16L	Inside Hexagonal Screw	4	M6x16L
225	HI-M6x25L	Inside Hexagonal Screw	6	M6x25L
226	HI-M8x20L	Inside Hexagonal Screw	5	M8x20L
229	HI-M10x20L	Inside Hexagonal Screw	4	M10x20L
230	HI-M10x30L	Inside Hexagonal Screw	4	M10x30L
233	HS-M6x8L	Settled Screw	6	M6x8L
240	PT1/8"	Oil Plugger	1	
244	USH50x60x6	USH Type Oil Seal	1	50x60x6
252	MR 1/2HP	Motor	1	1/2 HP

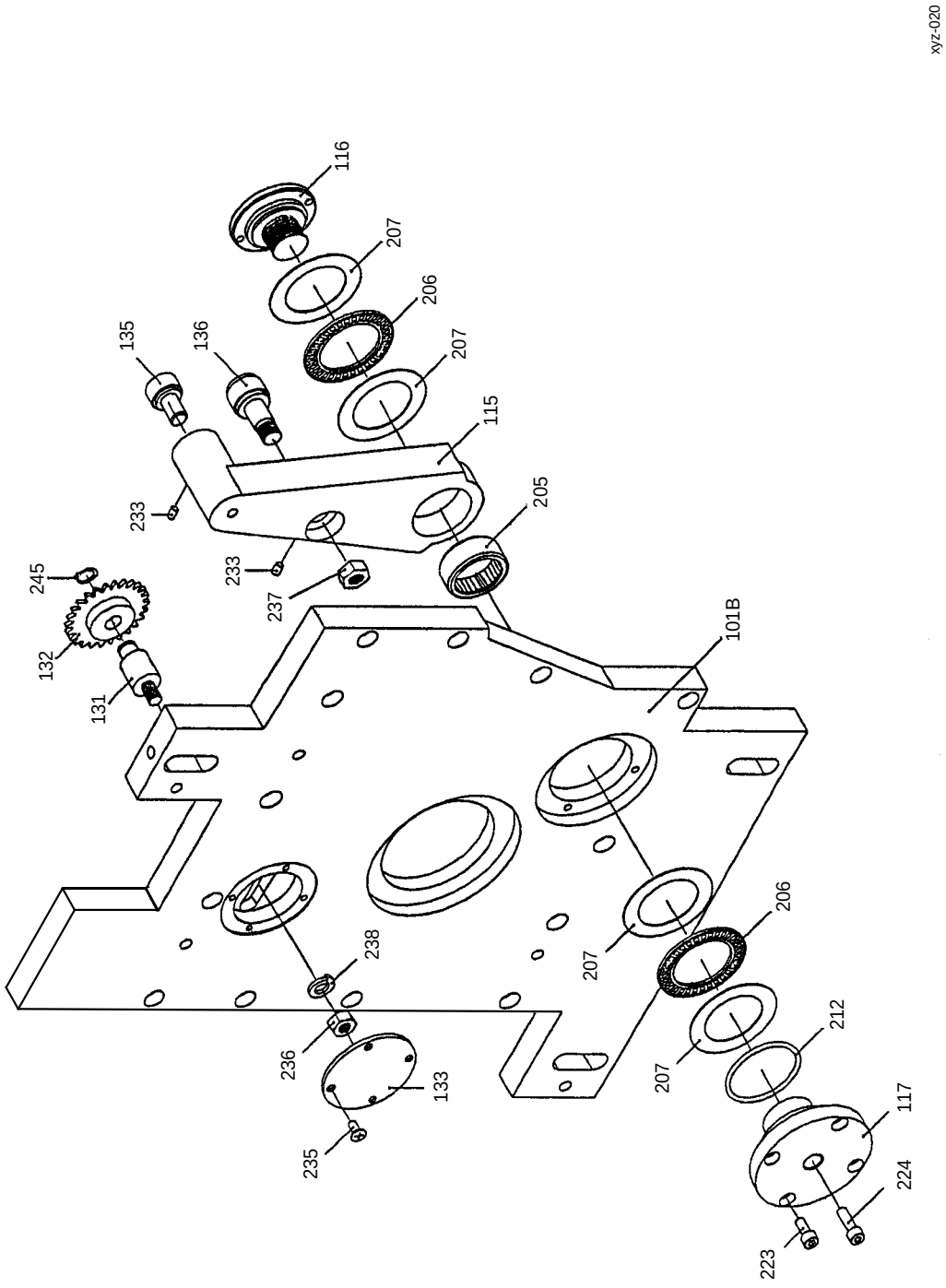

Figure 131 Idler sprocket and rocker

11.2.13 Idler Sprocket and Rocker

Item No	Part Number	Description	Quantity	Remarks
101B	A4020SC000B1	Case Cap	1	
115	A402D0100001	Rocker	1	
116	A402D0200001	Rocker Shaft	1	
117	A402D0300001	Rocker Stand Packing Cap	1	
131	A402J0100001	Idler Shaft	1	
132	A402J0200001	Idler Sprocket	1	
133	A402J0300001	Idler Outside Cap	1	
135	RB00022000A1	Bearing	1	Ø22
136	RB00024000A2	Bearing	1	Ø24
205	HK3516	Needle Bearing	1	
206	AXK1108	Thrust Bearing	2	
207	AS1108	Thrust Bearing Parcel	4	
212	G50	O ring	1	
223	HI-M6x14L	Inside Hexagonal Screw	4	M6x14L
224	HI-M6x16L	Inside Hexagonal Screw	1	
233	HS-M6x8L	Settled Screw	2	M6x8L
235	CO-M5x8L	Bury Screw	4	M5x8L
236	SC-M10	Hexagonal Screw Cap	1	M10
237	SC-M12	Hexagonal Screw Cap	1	M12
238	WS-M10	Gasket	1	M10
245	C12S	Circlip	1	C12

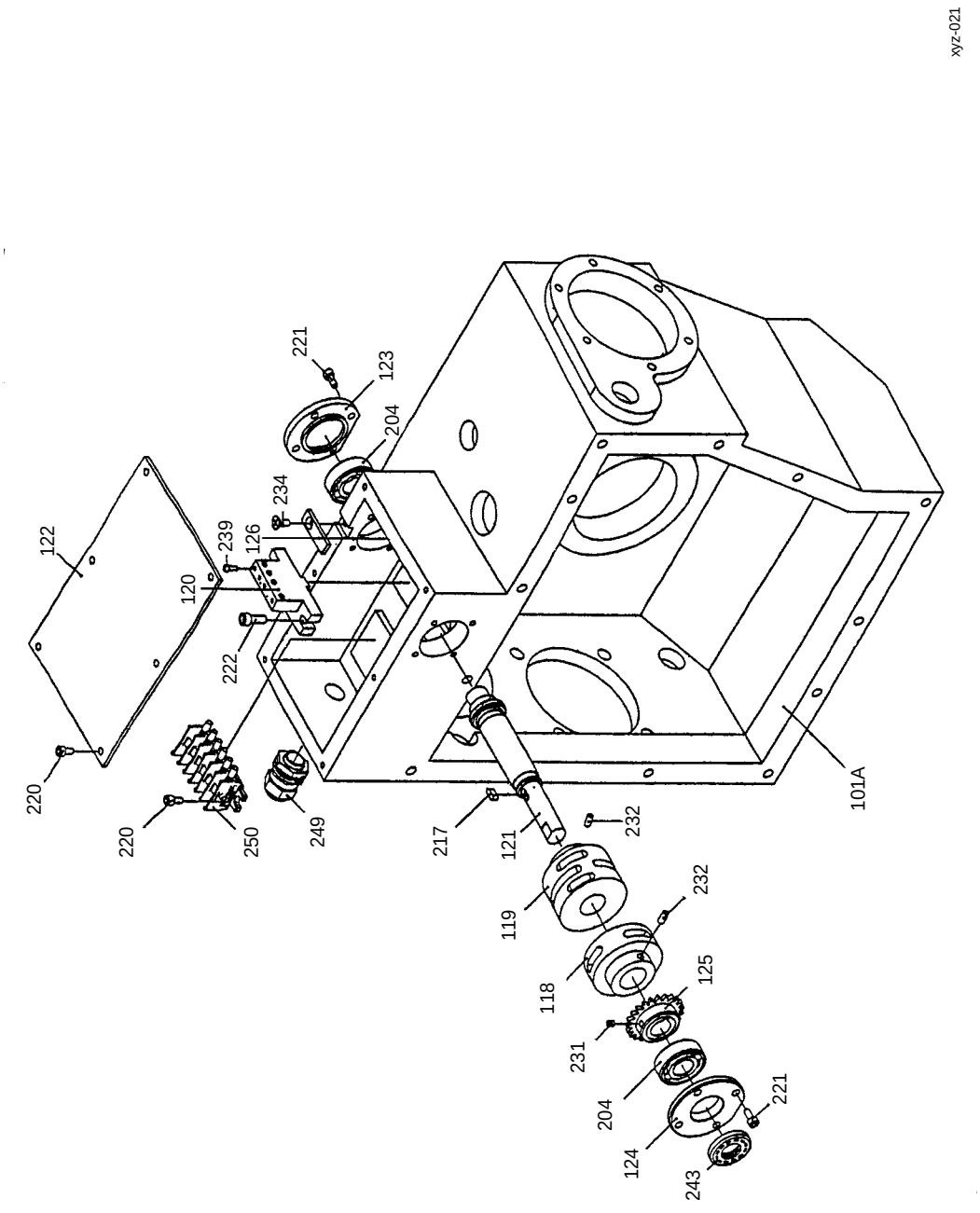

Figure 132 Signal

11.2.14 Signal

Item No	Part Number	Description	Quantity	Remarks
101A	A4020SC000A1	Case	1	
118	A402E01000A1	Brake Signal Wheel	1	
119	A402E01000B1	Cam Signal Wheel	1	
120	A402E0200001	Signal Fixture	1	
121	A402E0300001	Signal Shaft	1	
122	A402E0400001	Dustproof Cap	1	
123	A402E0500001	Signal Cap	1	
124	A402E0600001	Signal Cap	1	
125	A402E0700001	Signal Sprocket	1	
126	A402E0800001	Signal Try Up Parcel	1	
204	BR6202	Deep Groove Ball Bearing	4	
217	DFK4x4x10	Double Circle Key	4	4x4x10
220	HI-M4x8L	Inside Hexagonal Screw	8	M4x8L
221	HI-M4x10L	Inside Hexagonal Screw	8	M4x10L
222	HI-M5x16L	Inside Hexagonal Screw	2	M5x16L
231	HS-M5x5L	Settled Screw	1	M5x5L
232	HS-M5x10L	Settled Screw	2	M5x10L
239	PF-308	Plastic Screw (KSS)	4	M3x8L
243	TC15x24x5	TC Type Oil Seal	1	15x24x5
249	AG-16	Wire Stud (KSS)	1	
250	TM-10A600V	Terminal Frisket	1	C12

12.0 Machine Wiring

12.1 Machine Wiring

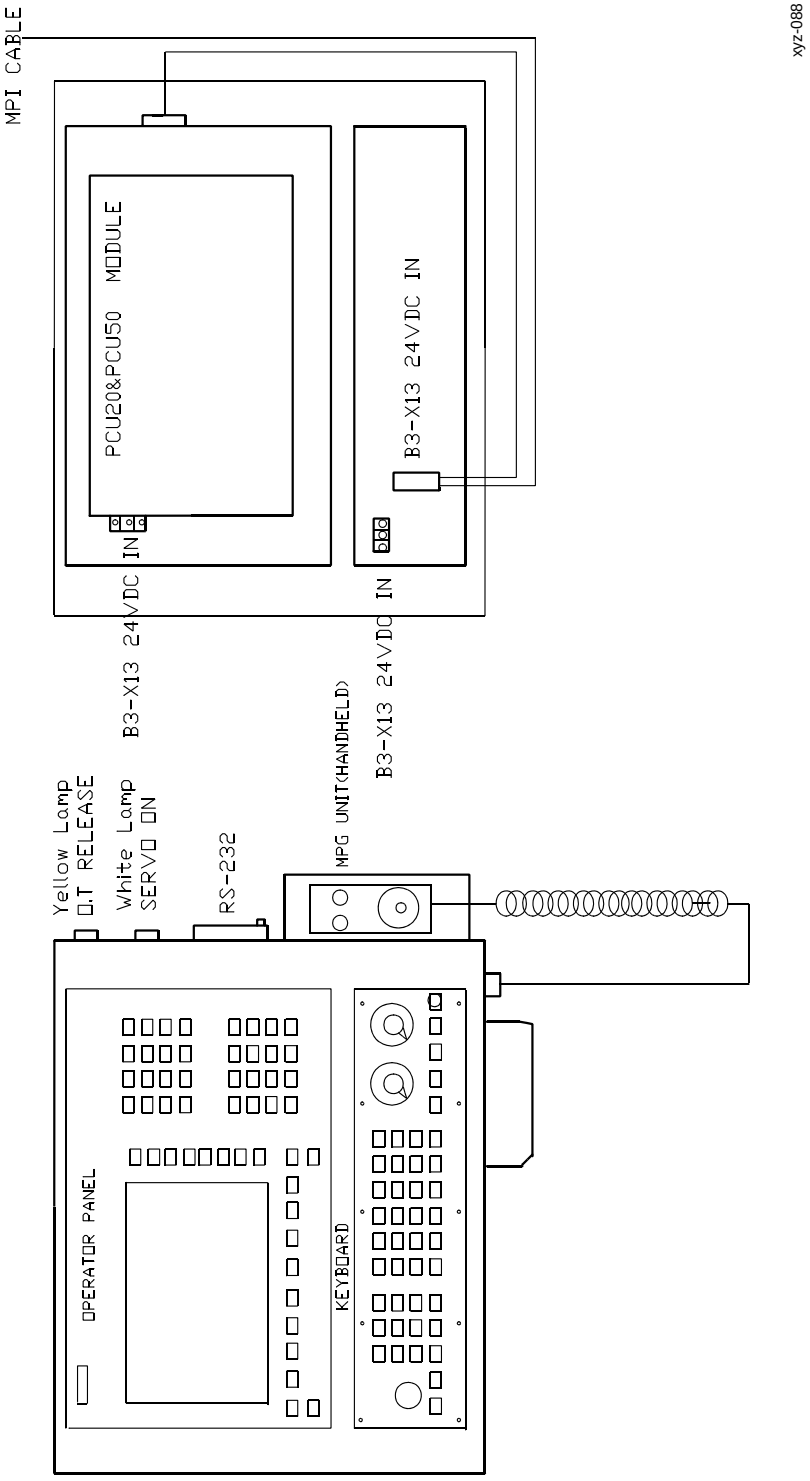

Figure 133 Manual panel

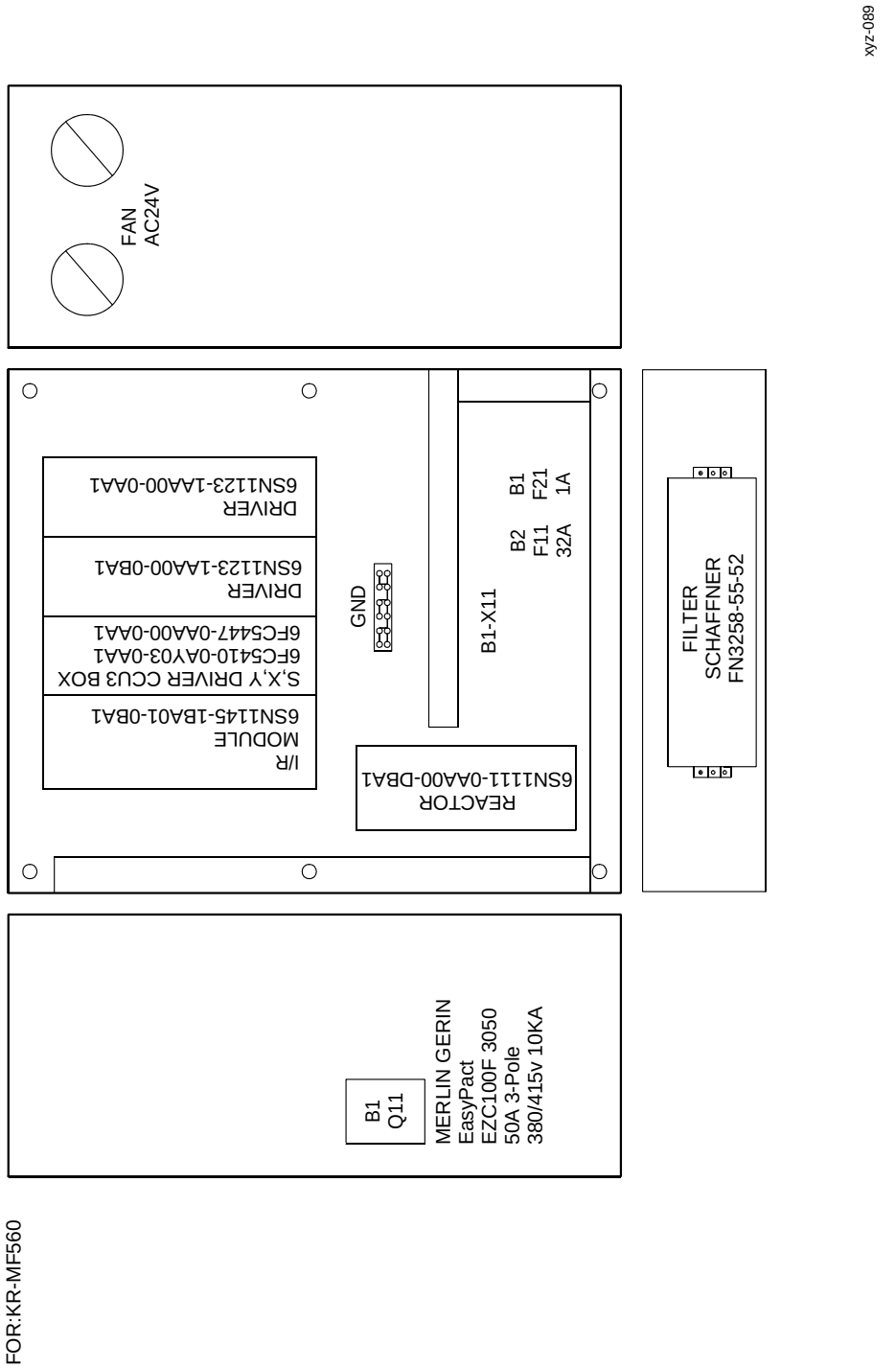

Figure 134 Layout

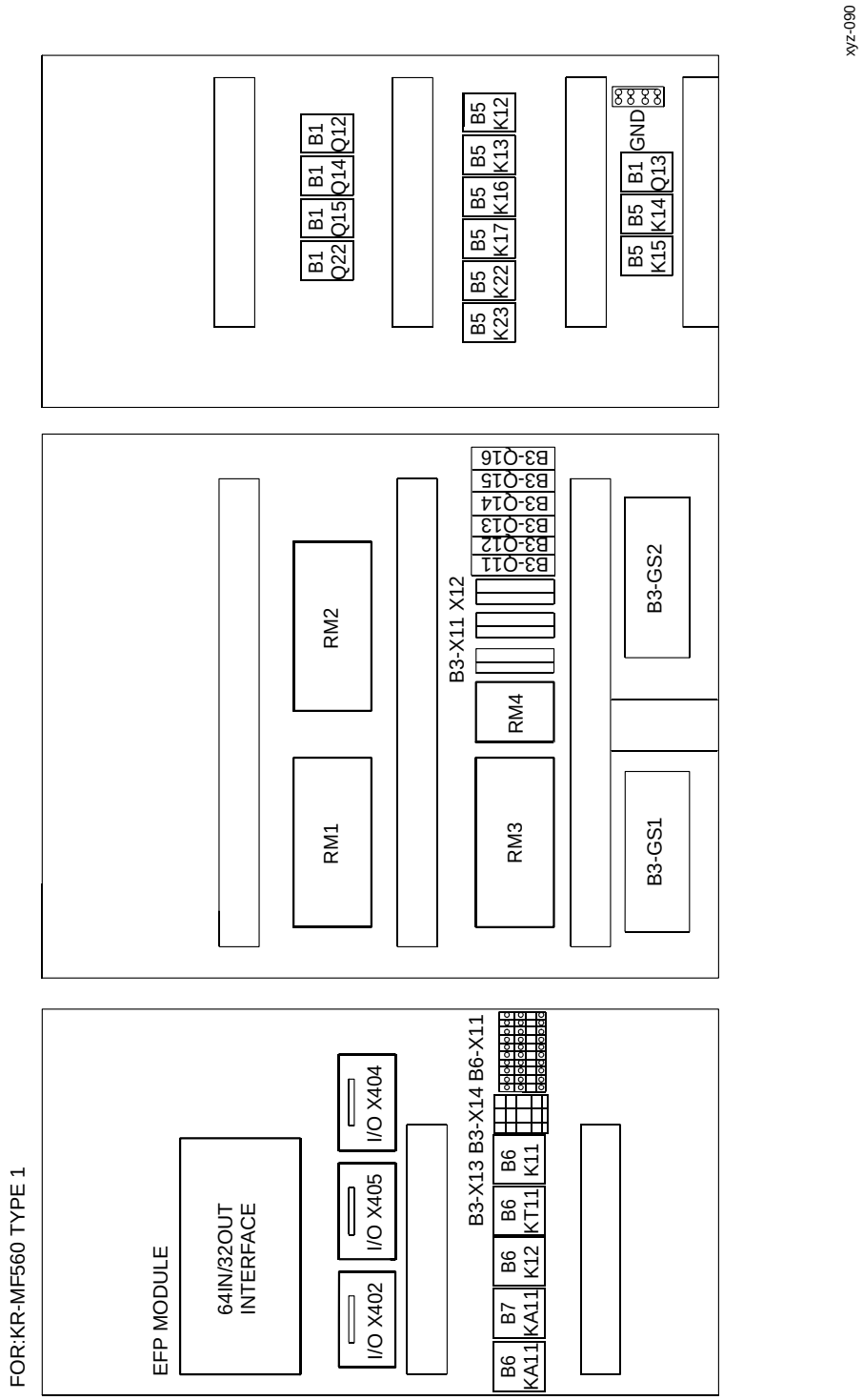

Figure 135 Layout

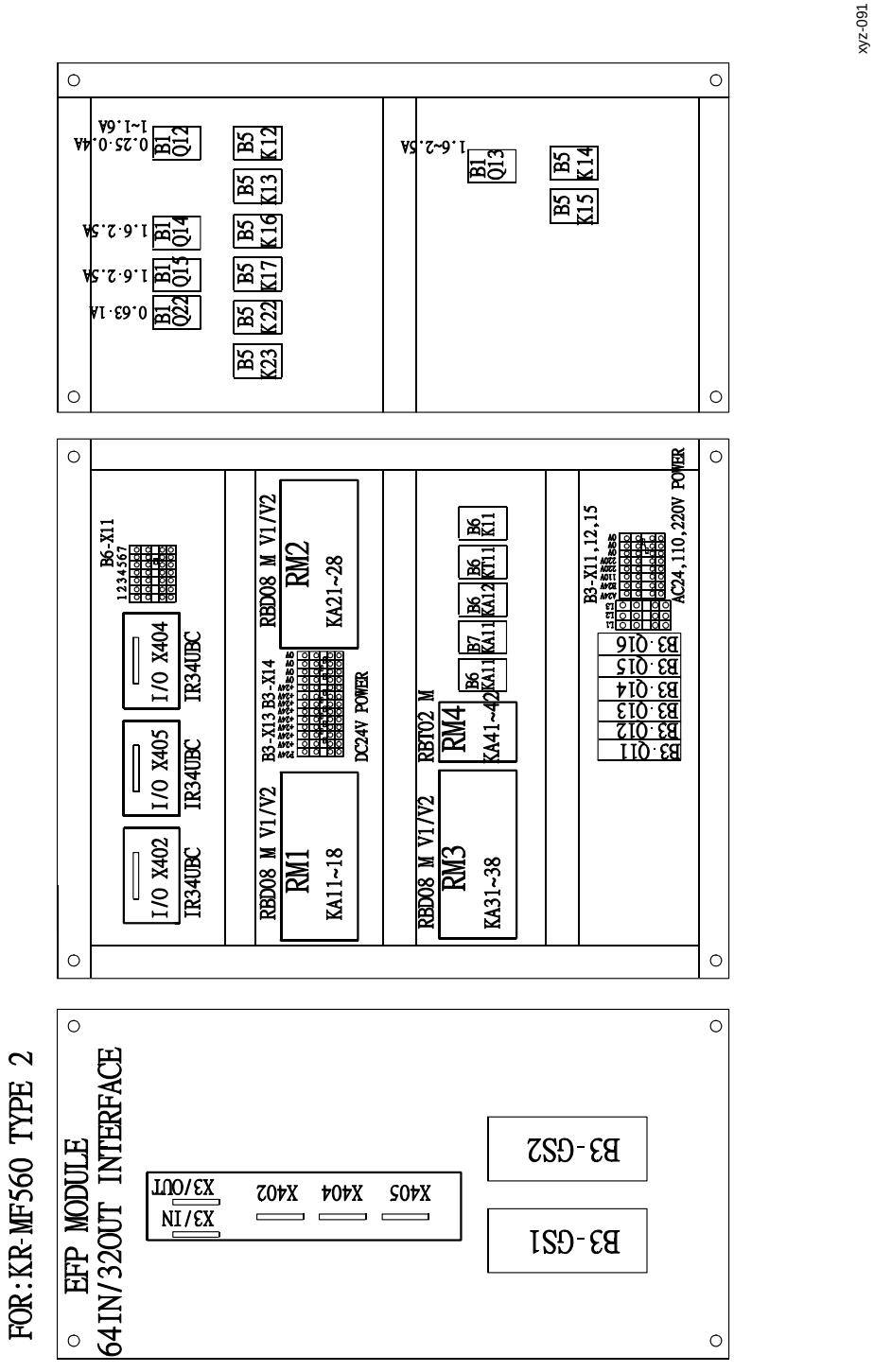

Figure 136 Layout

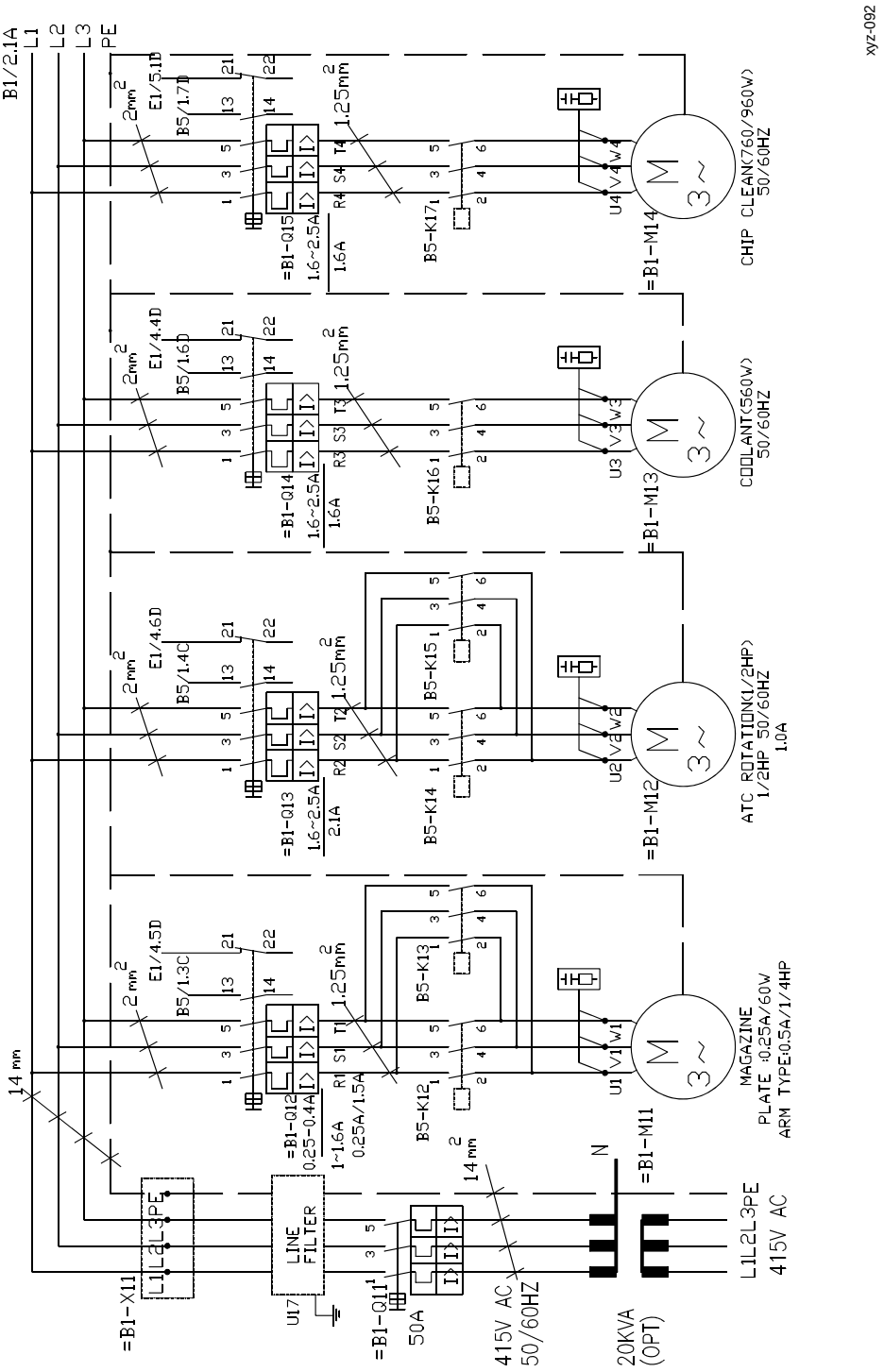

Figure 137 Power circuit

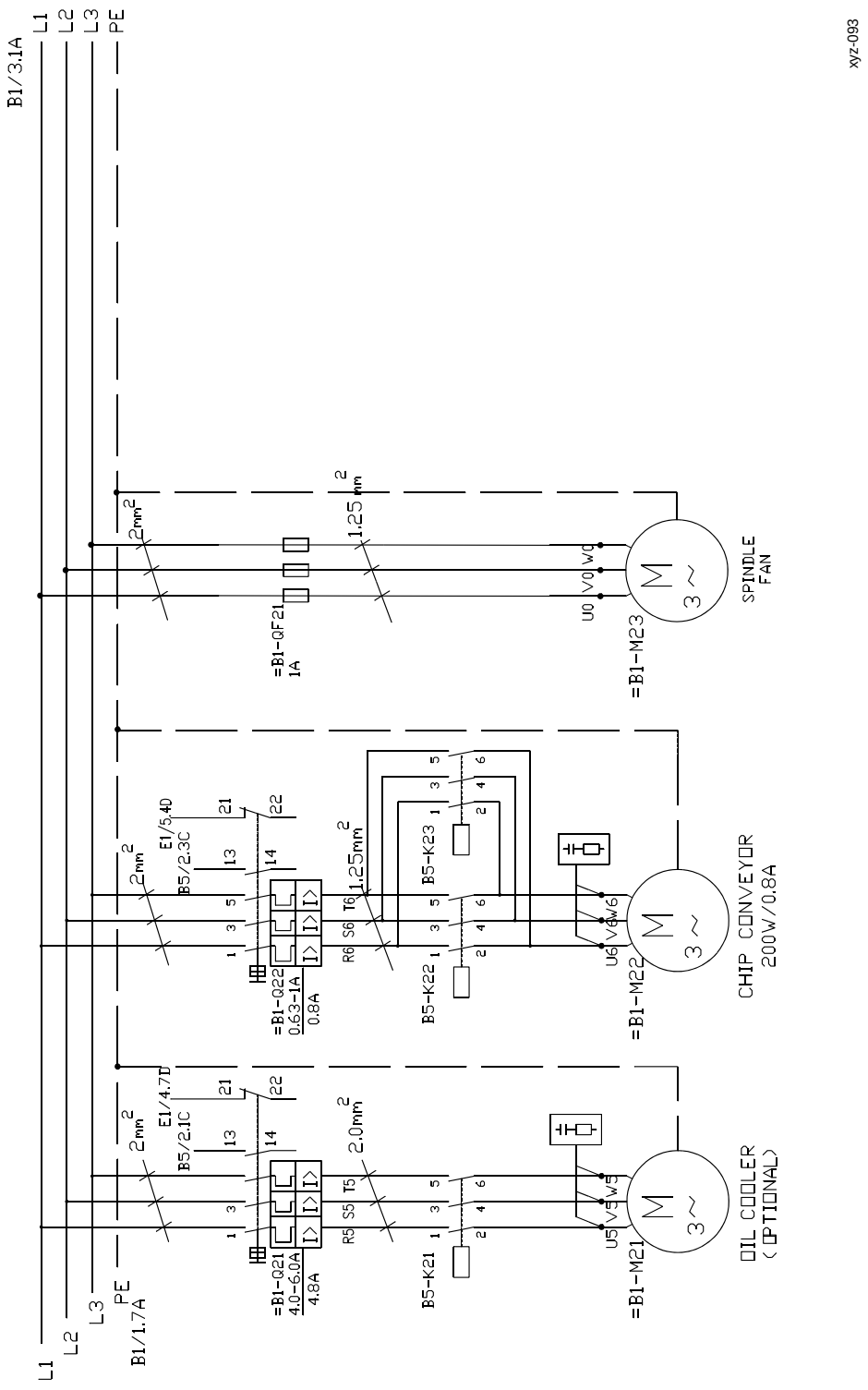

Figure 138 Power circuit

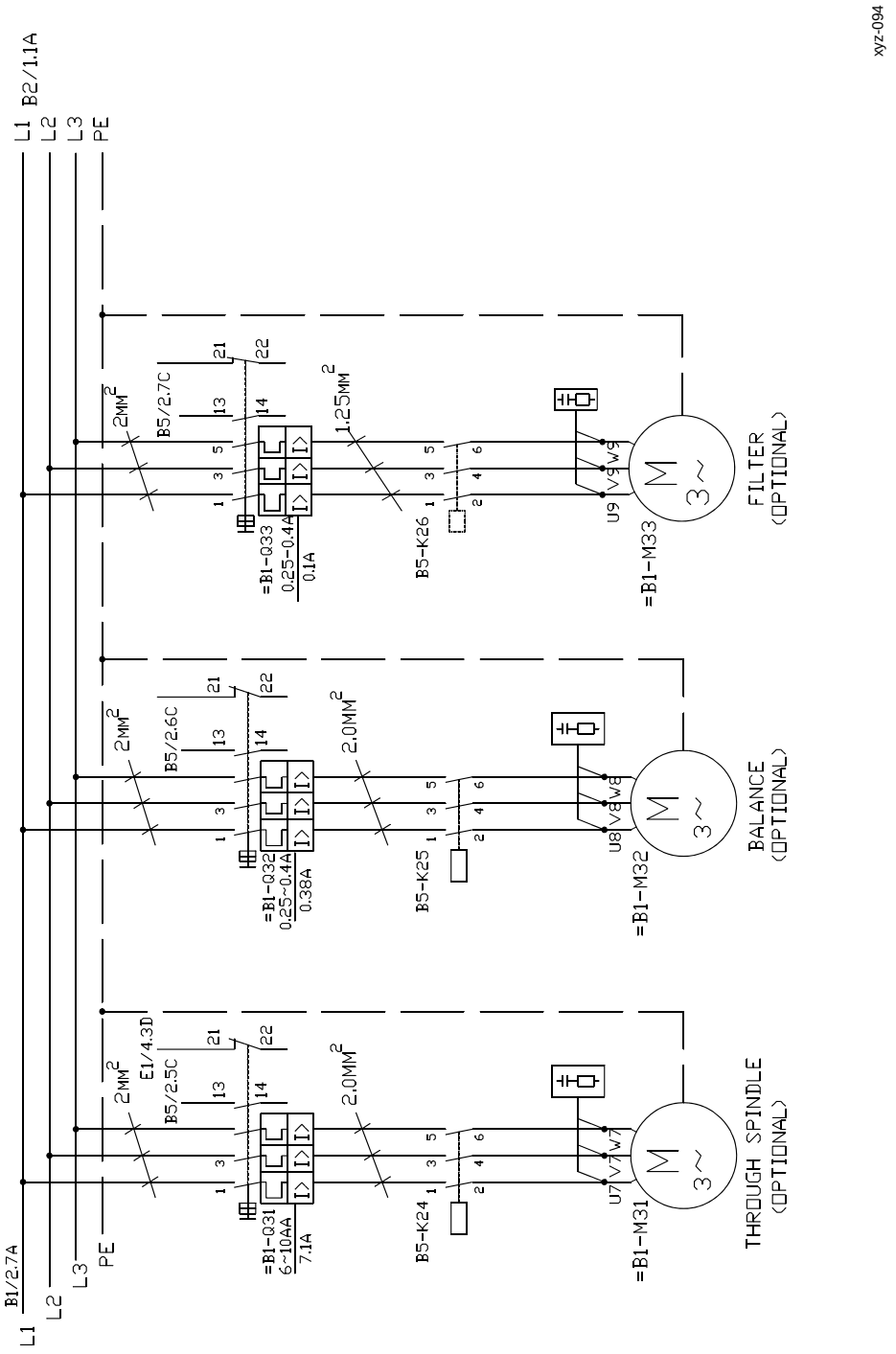

Figure 139 Power circuit

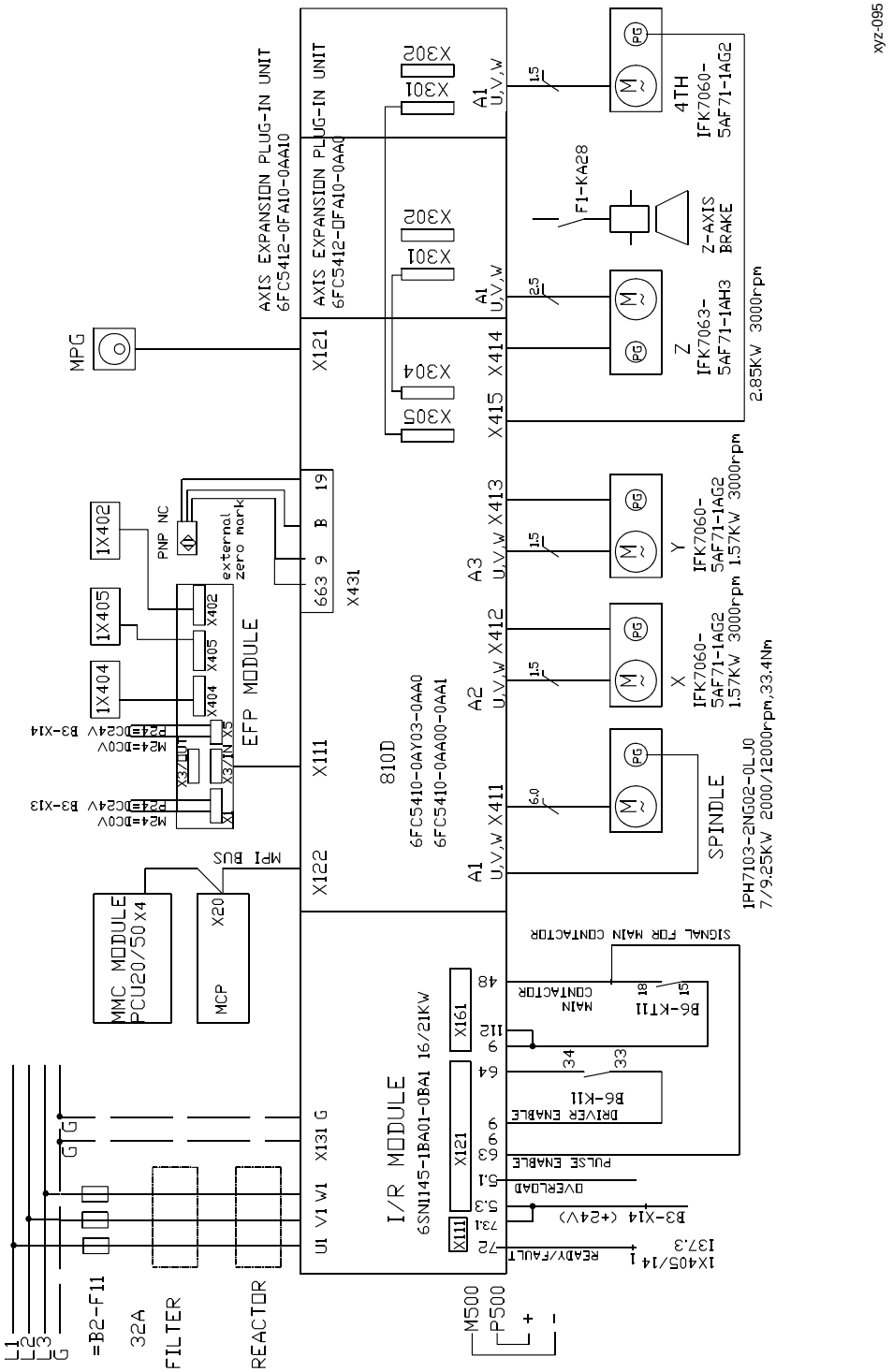

Figure 140 CNC system

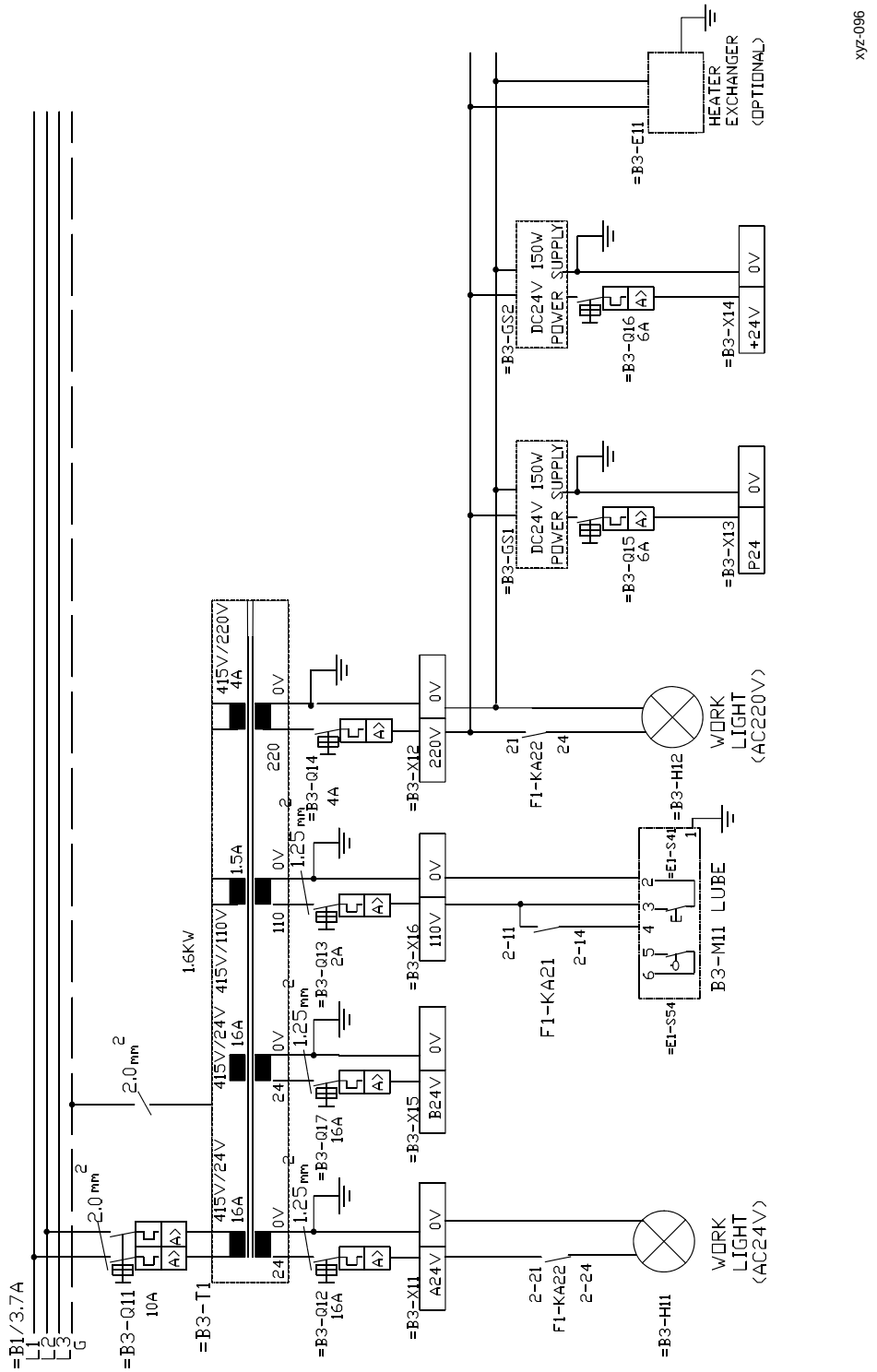

Figure 141 Tran circuit

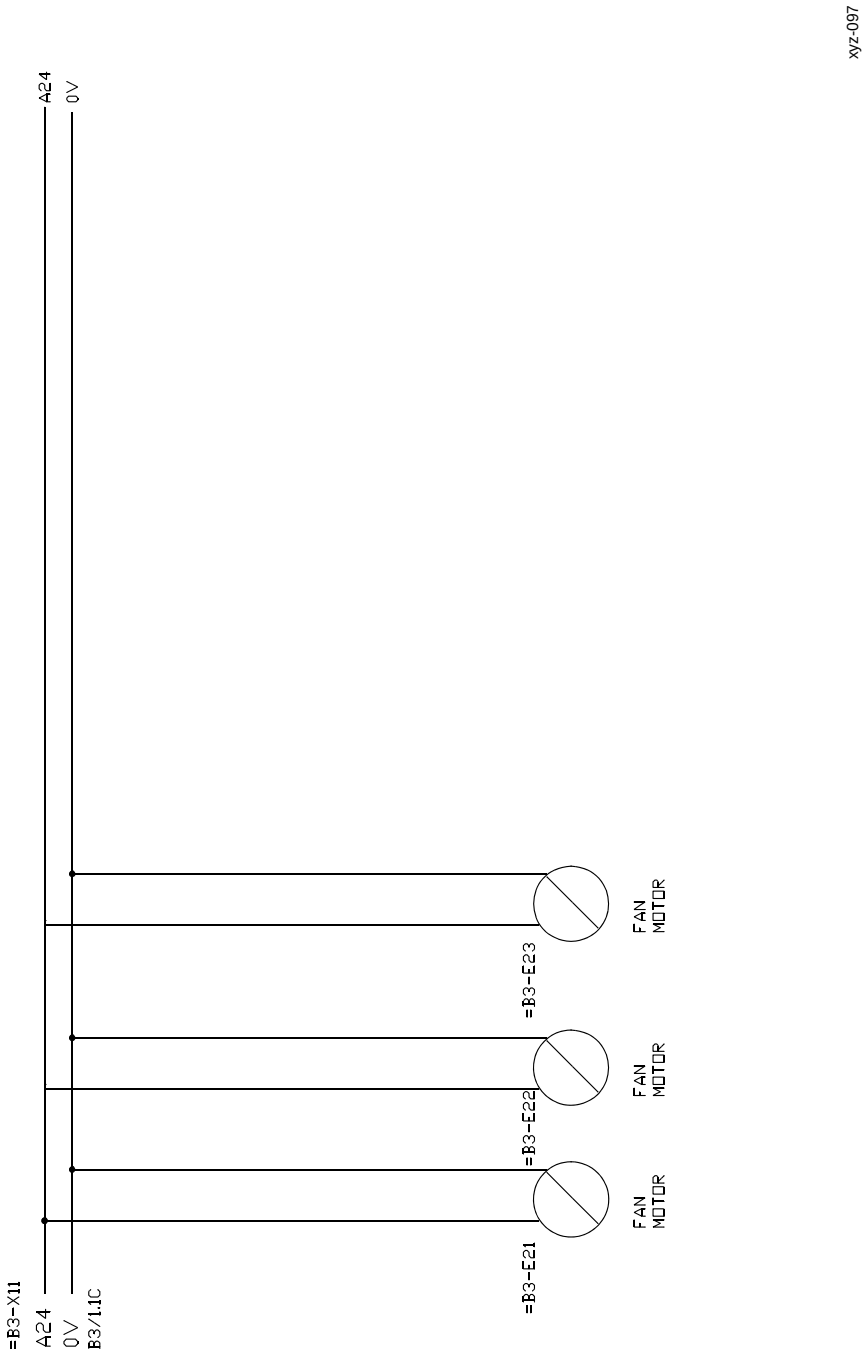

Figure 142 Tran circuit

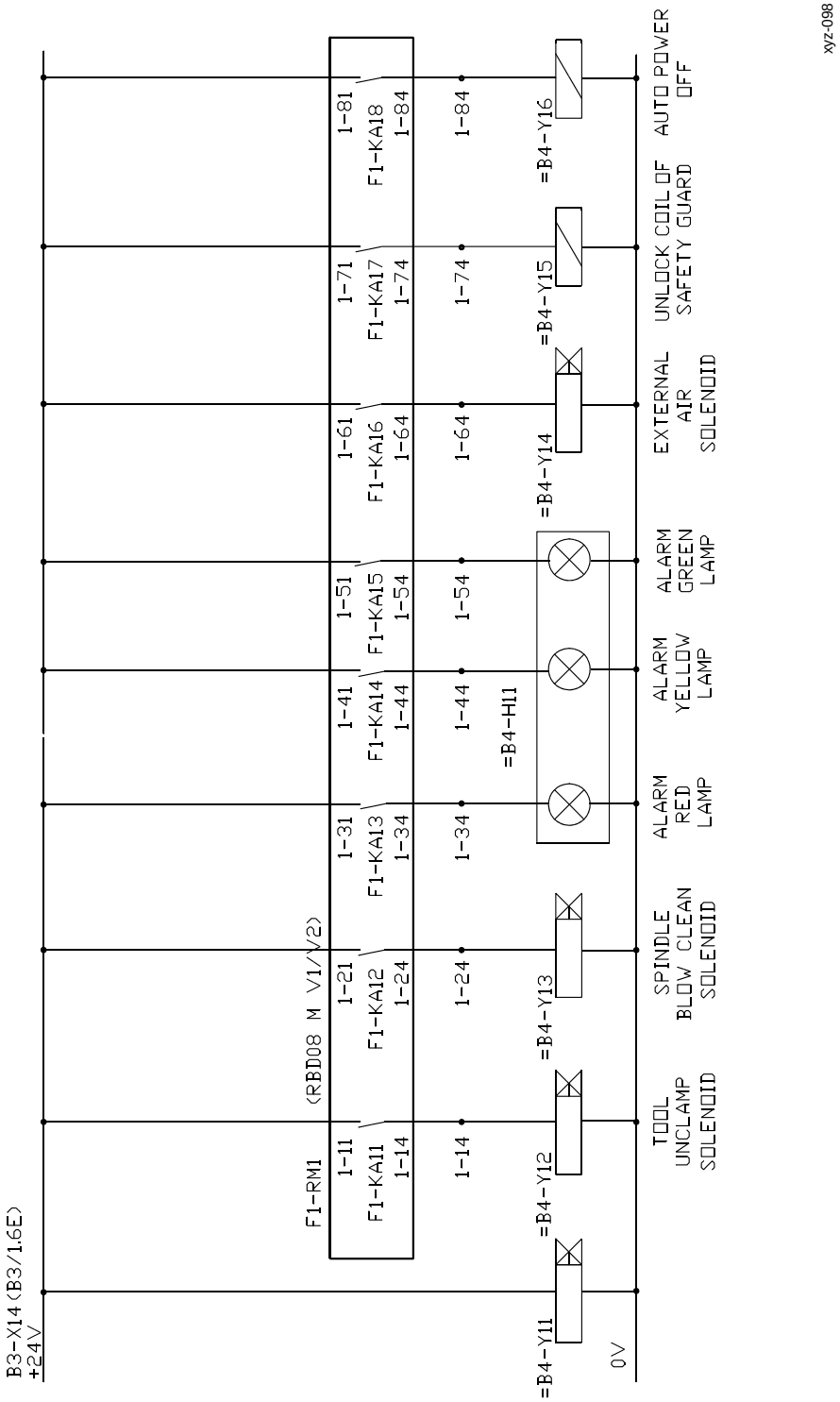

Figure 143 DC24V circuit

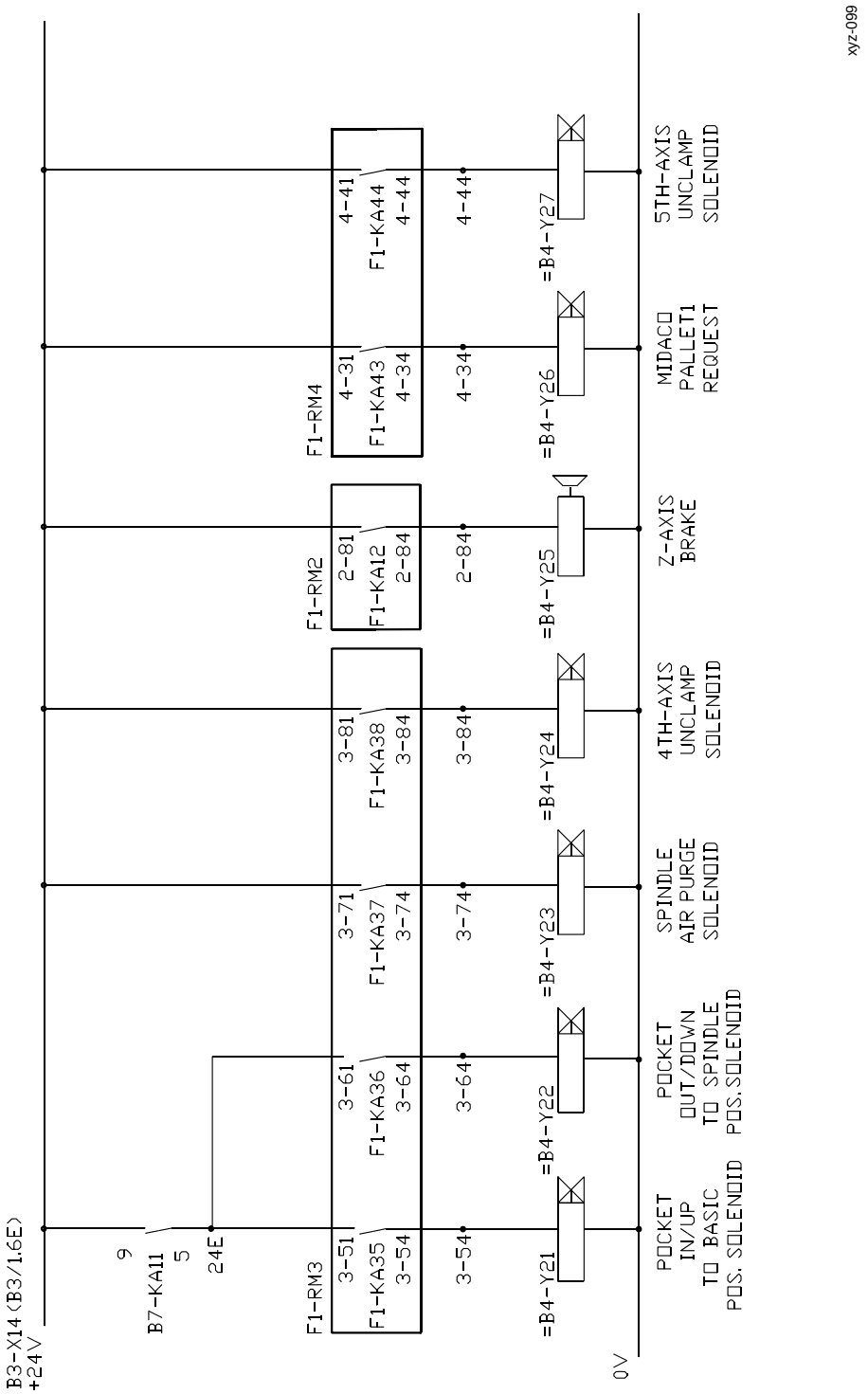

Figure 144 DC24V circuit

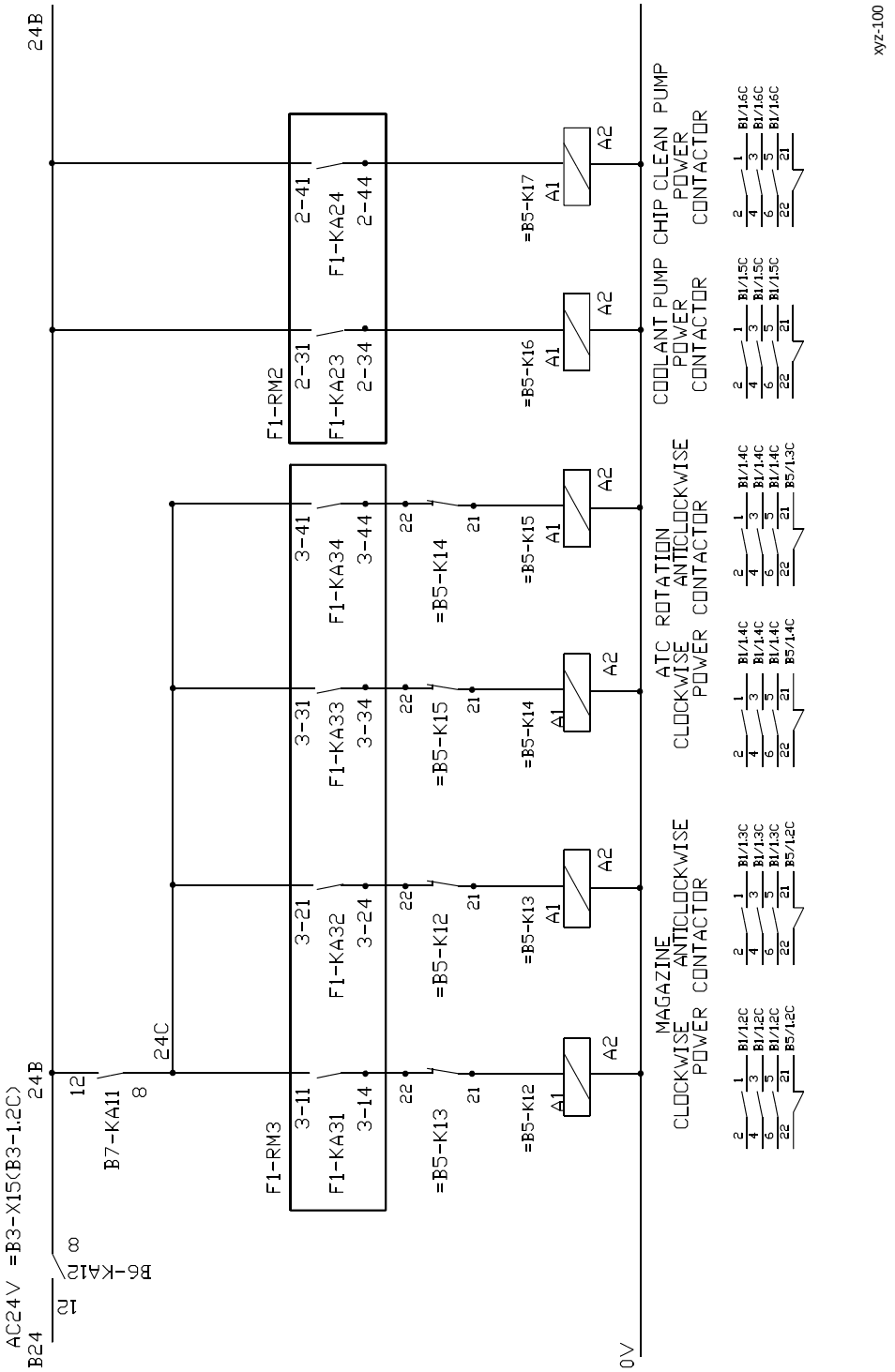

Figure 145 AC24V circuit

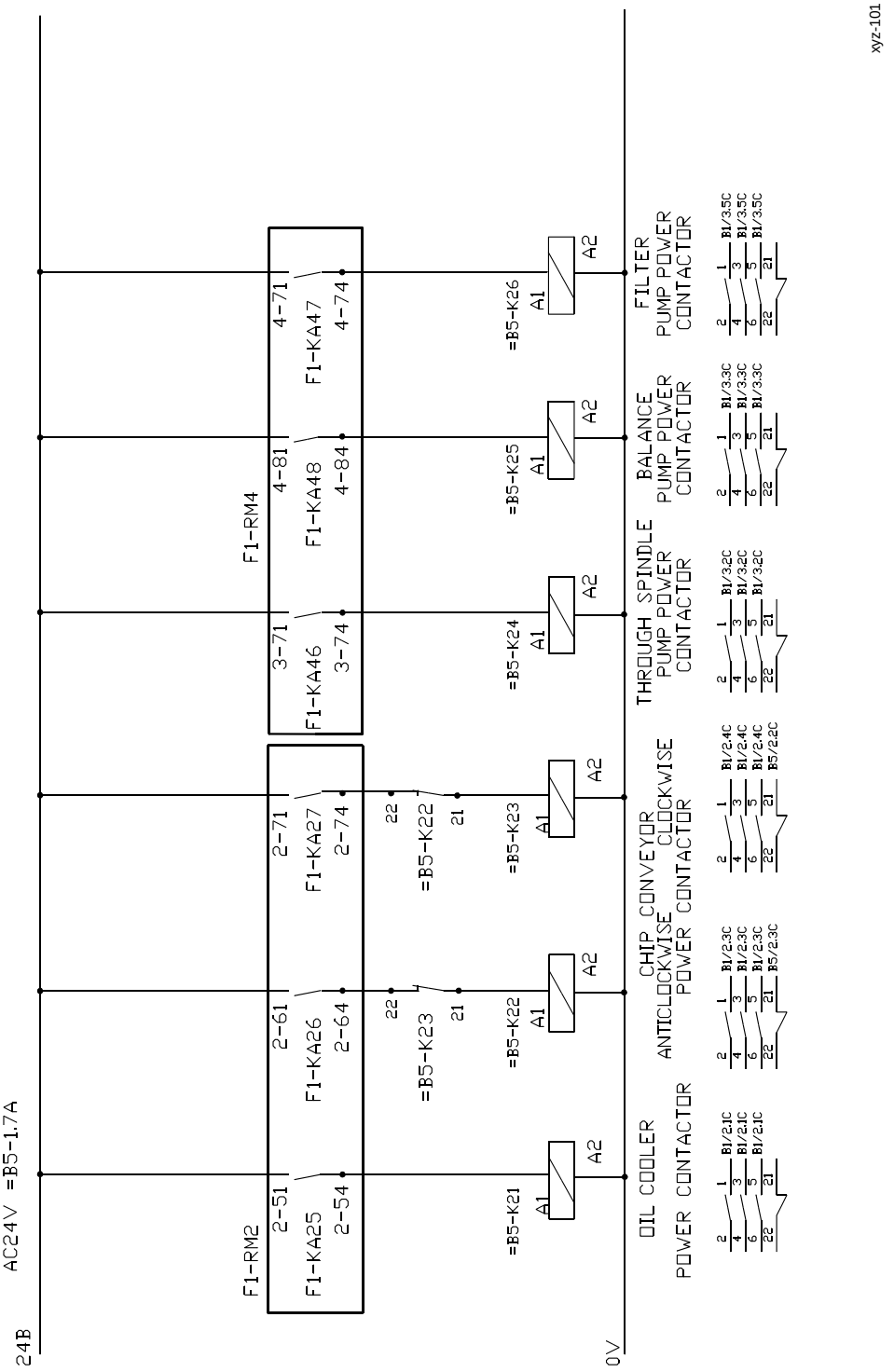

Figure 146 AC24V circuit

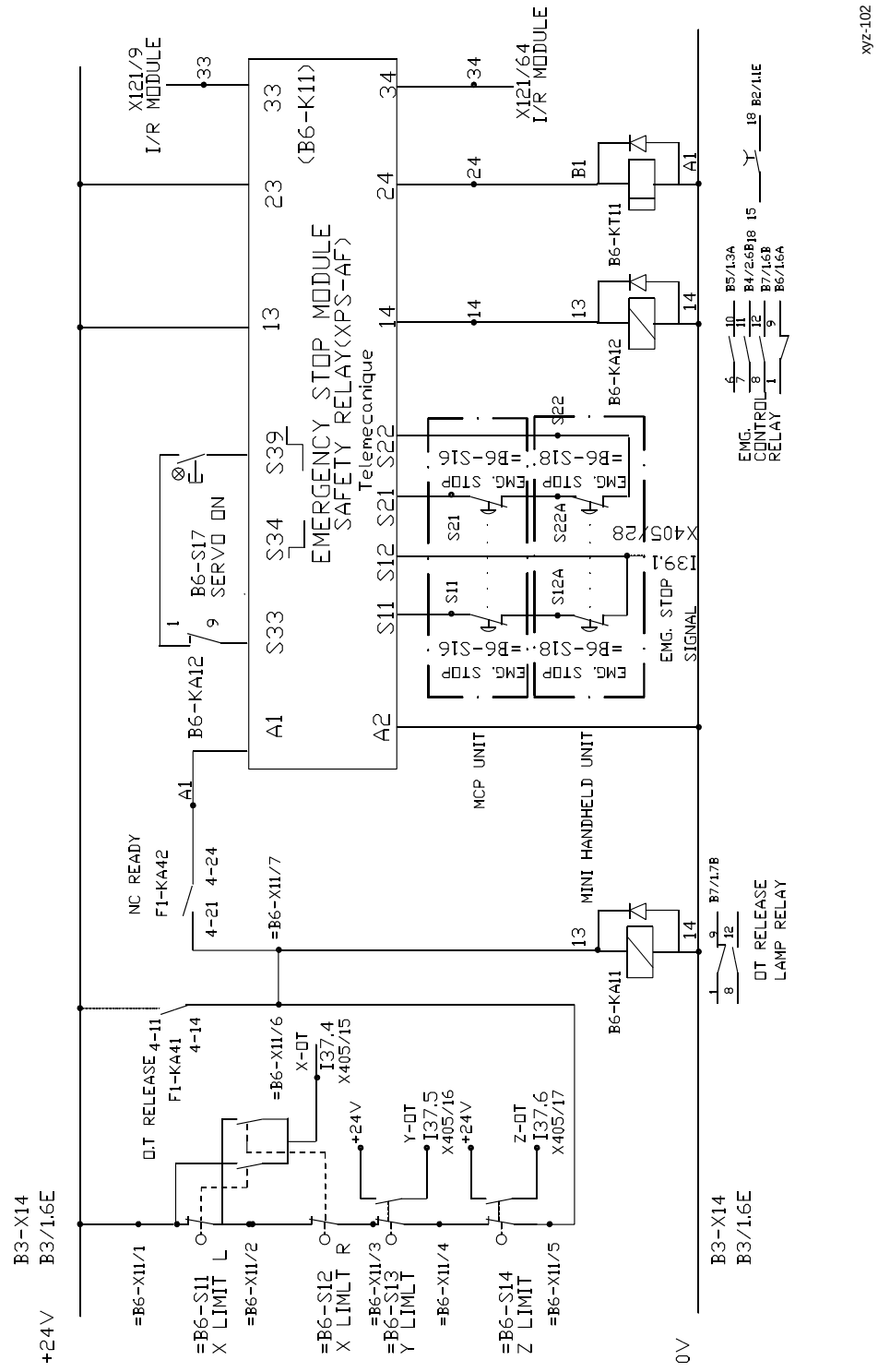

Figure 147 Emergency circuit

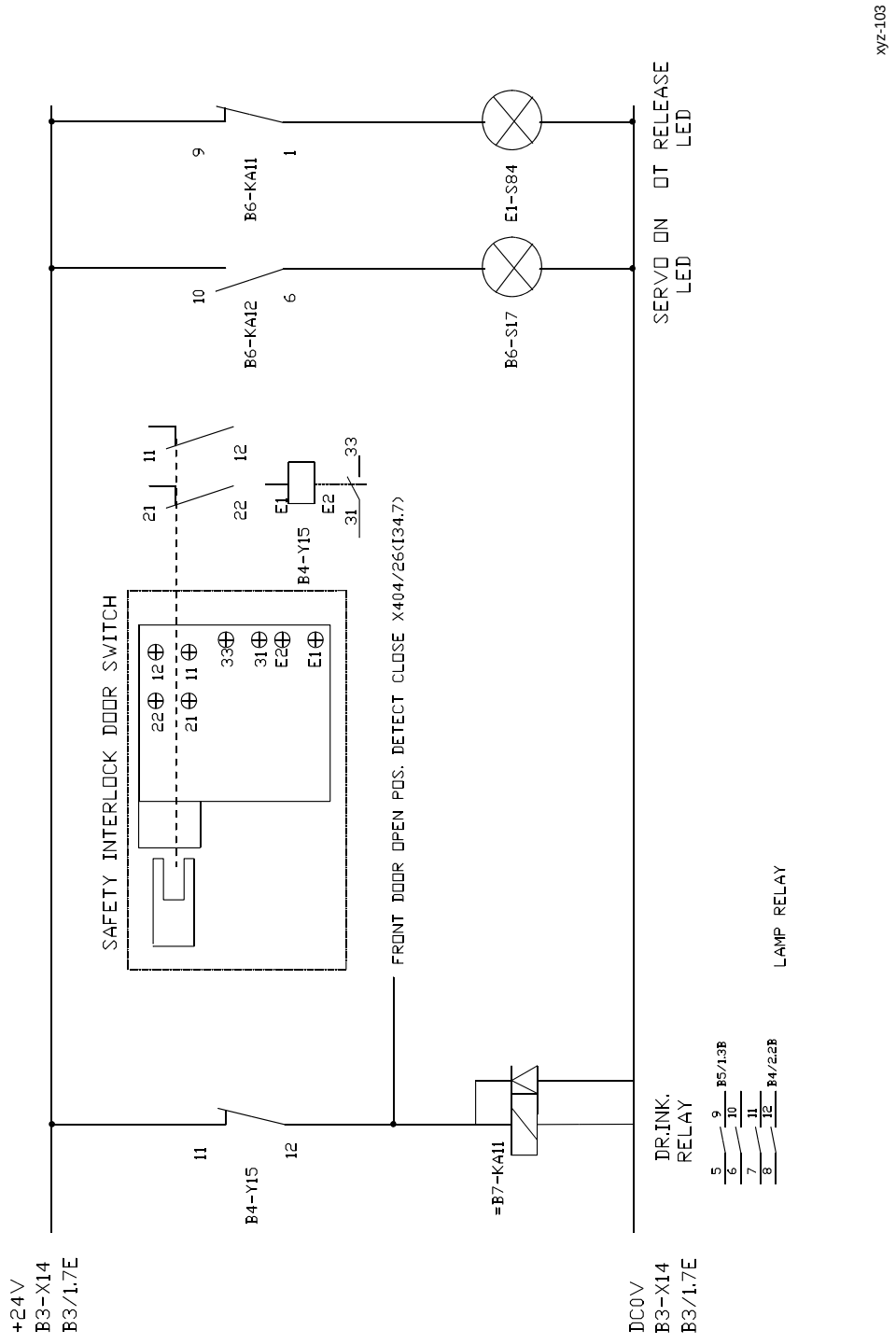

Figure 148 D.K. circuit

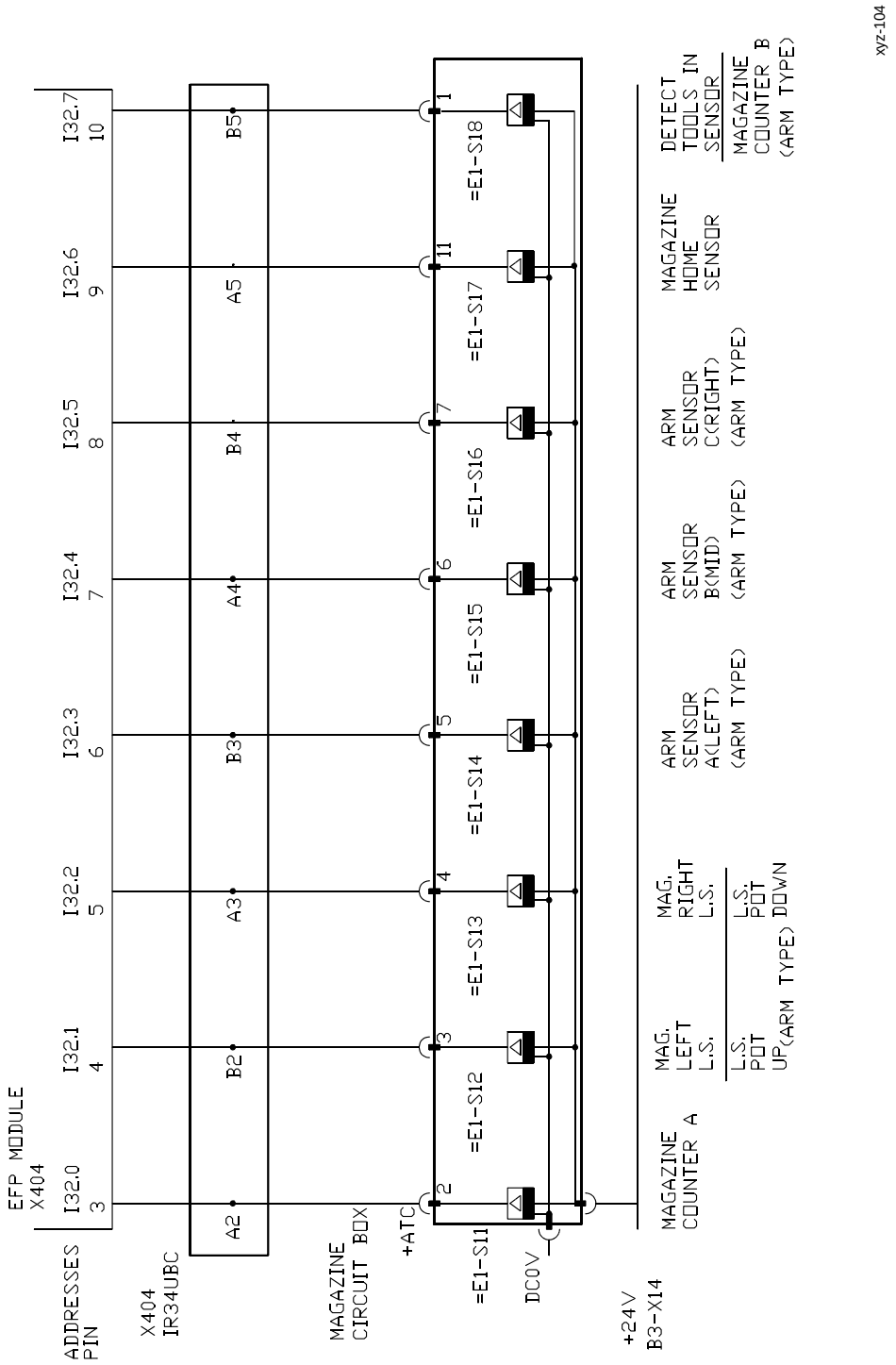

Figure 149 Input define

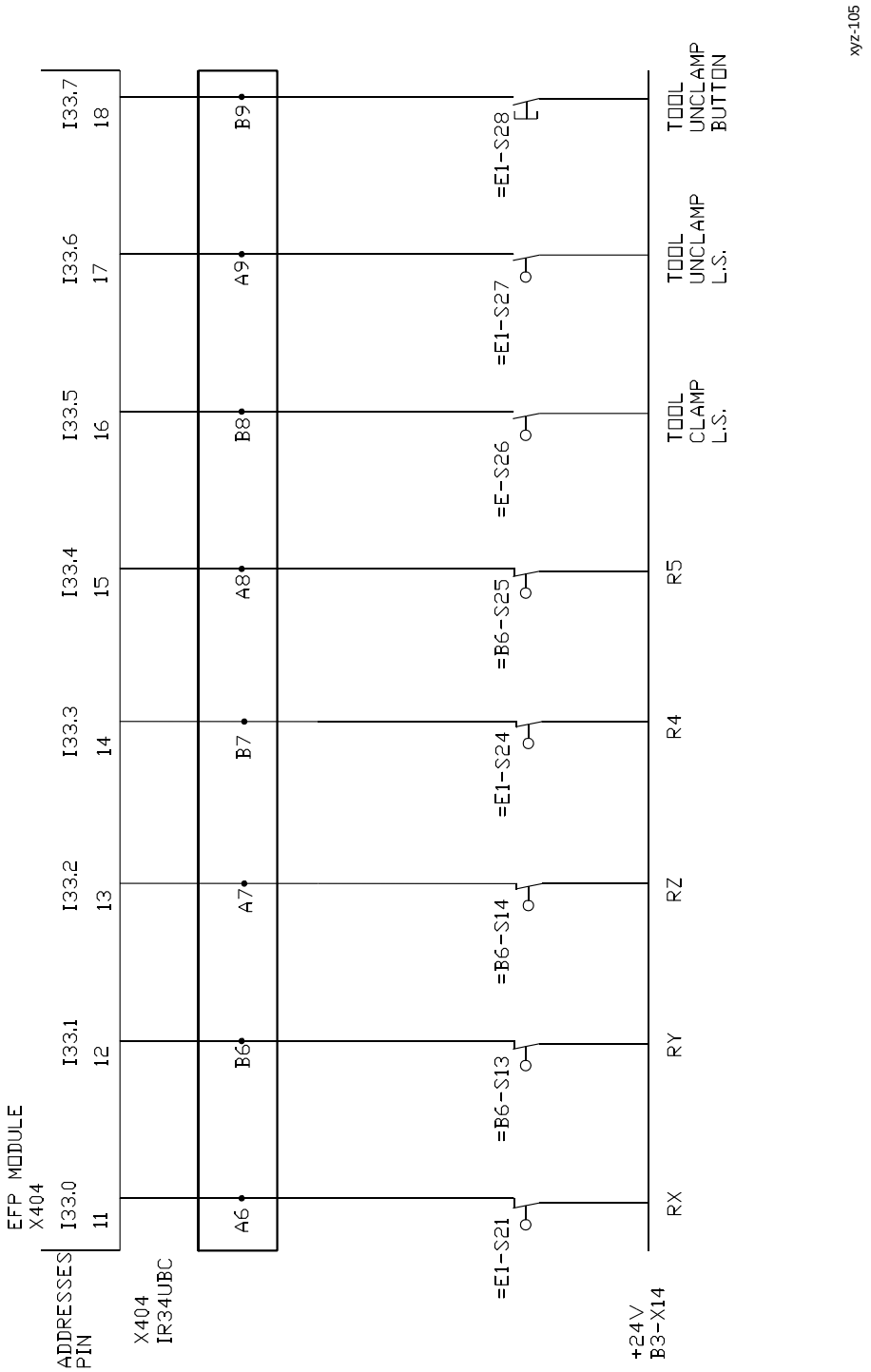

Figure 150 Input define

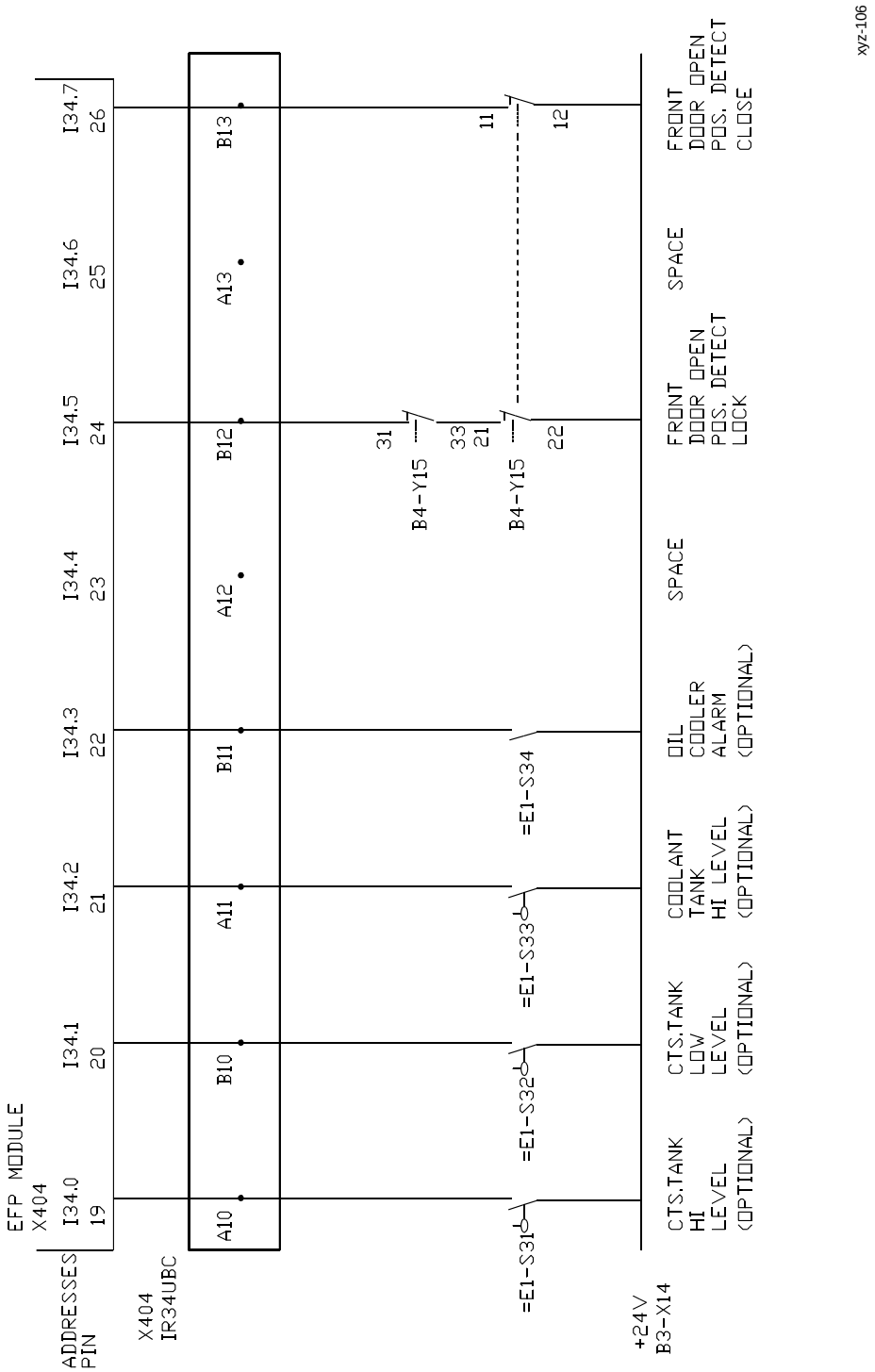

Figure 151 Input define

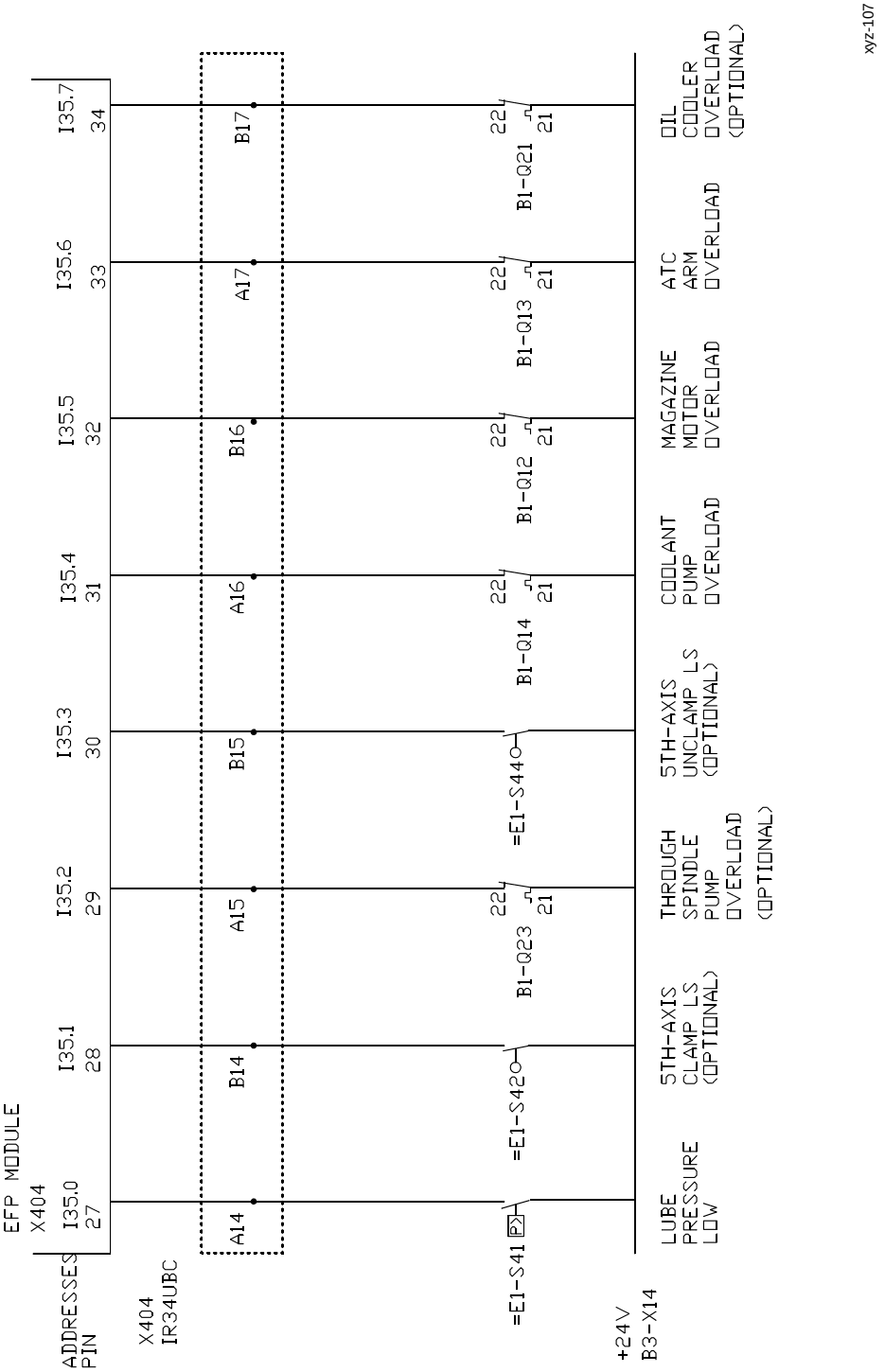

Figure 152 Input define

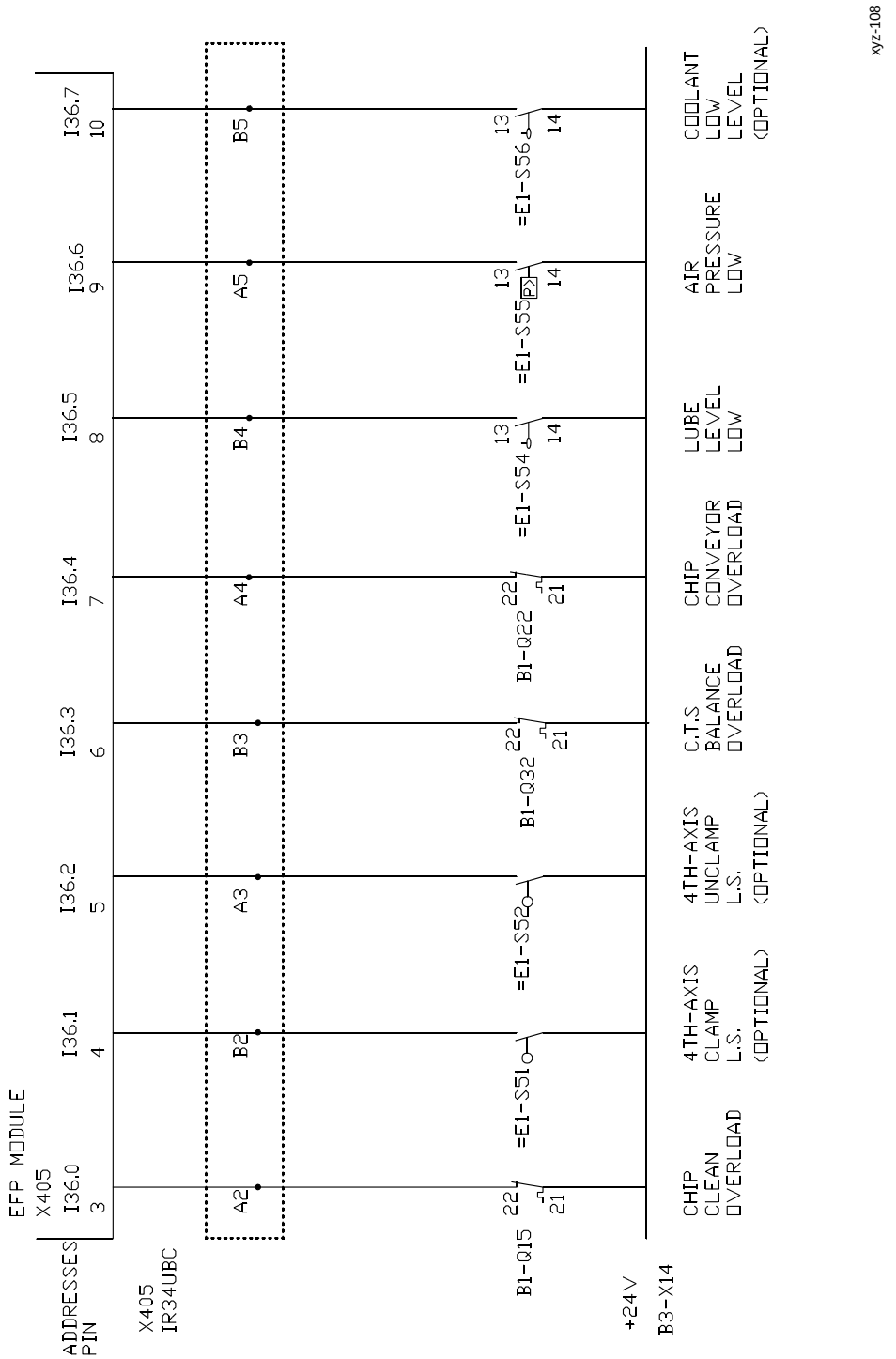

Figure 153 Input define

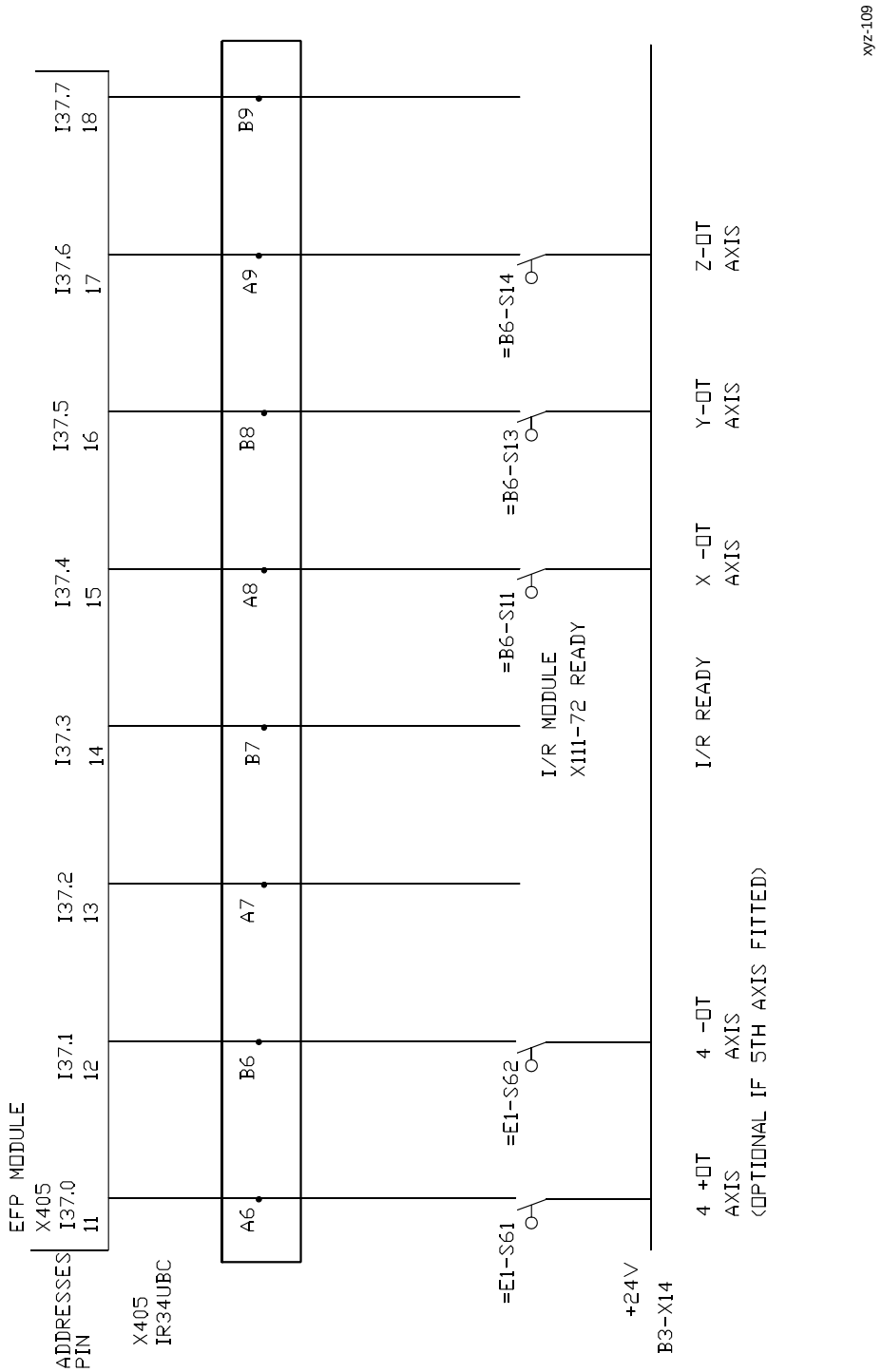

Figure 154 Input define

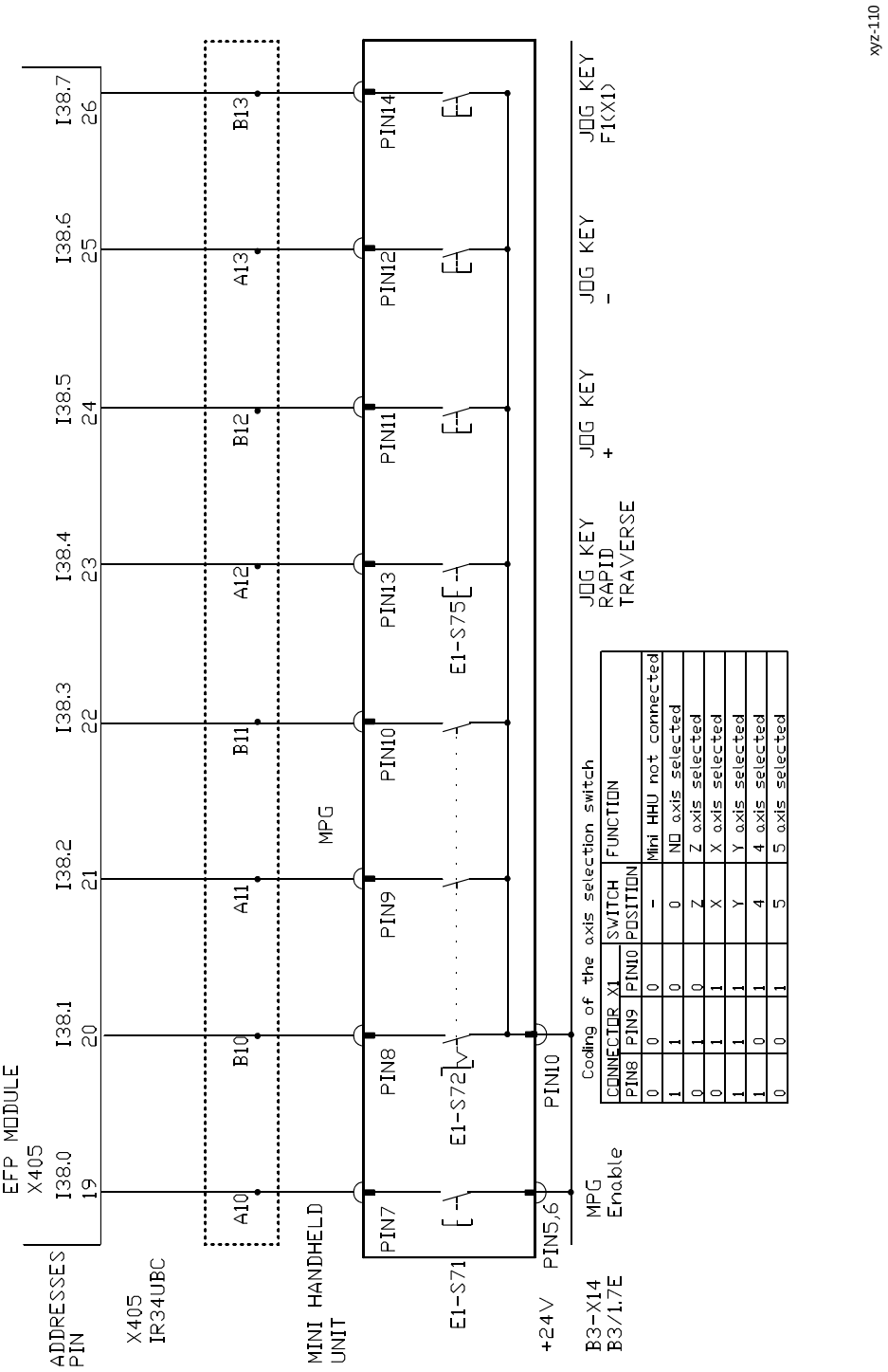

Figure 155 Input define

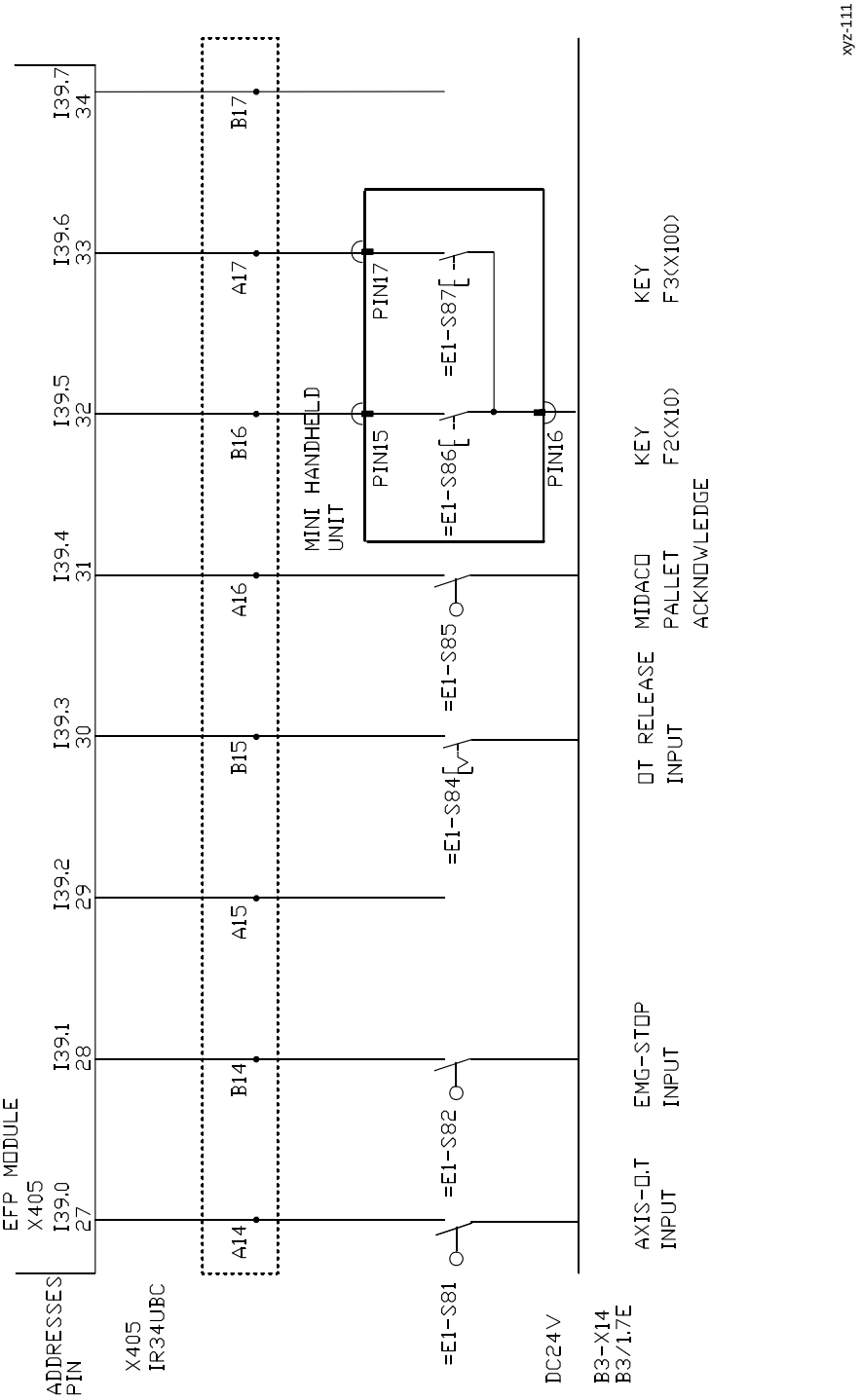

Figure 156 Input define

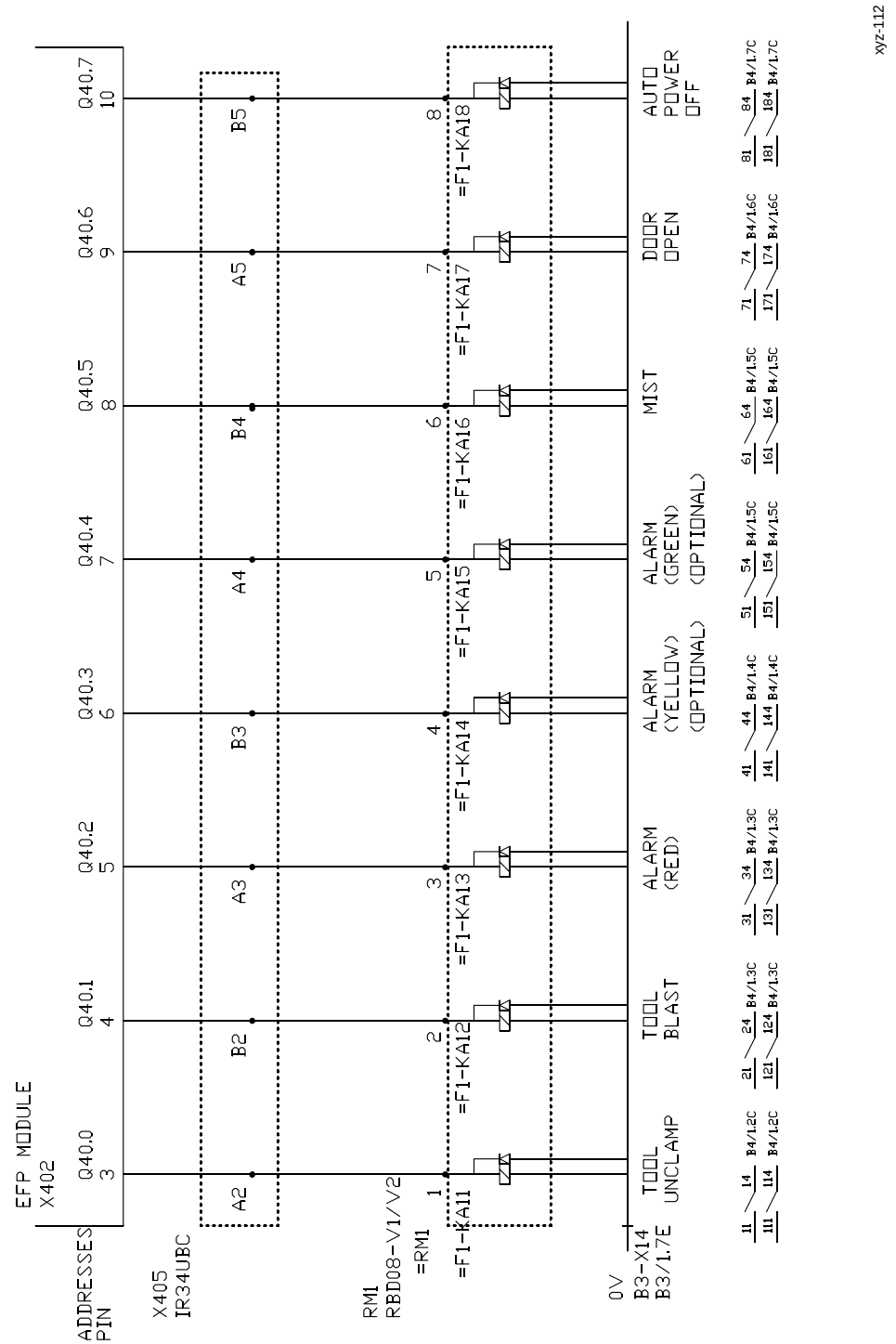

Figure 157 Output define

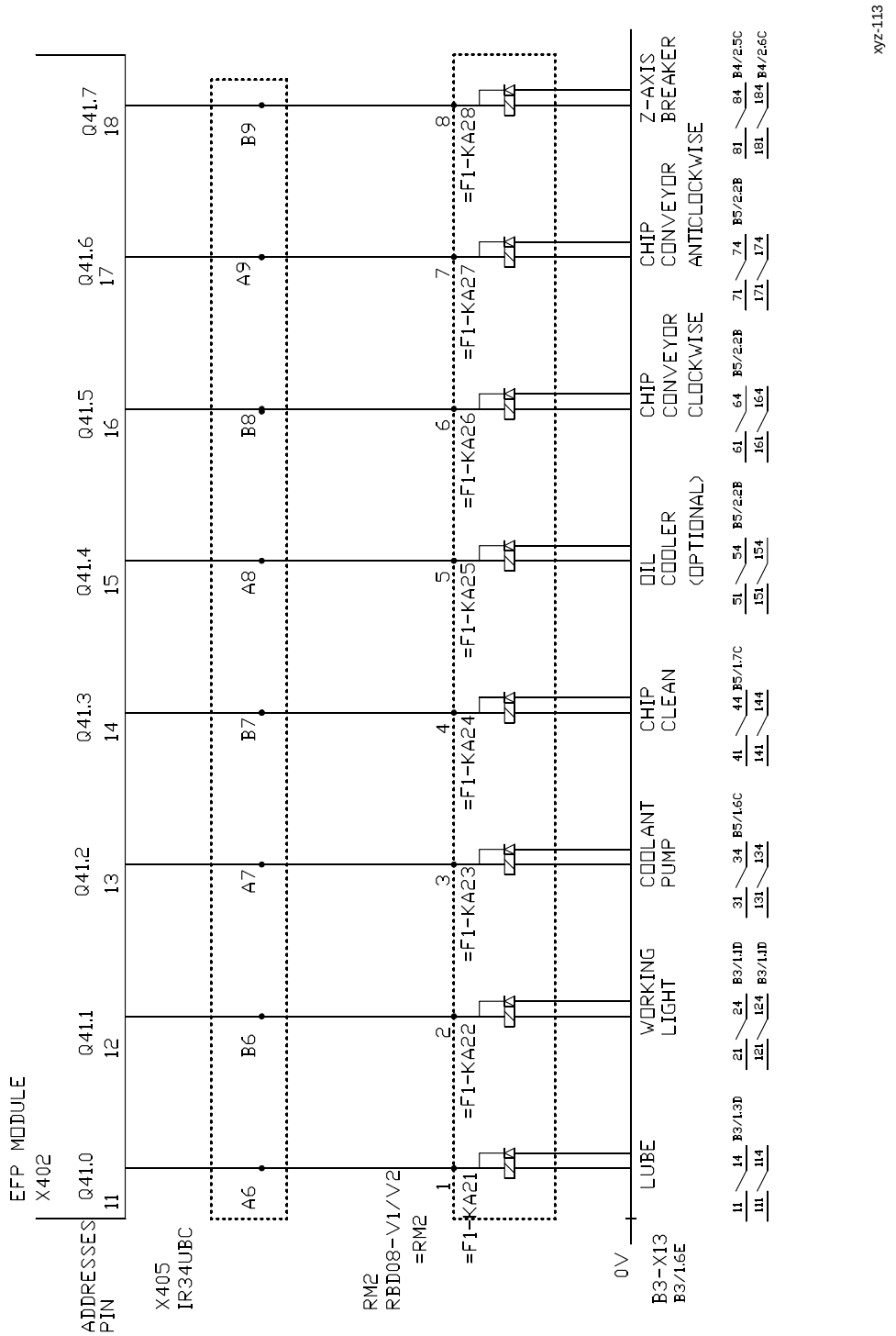

Figure 158 Output define

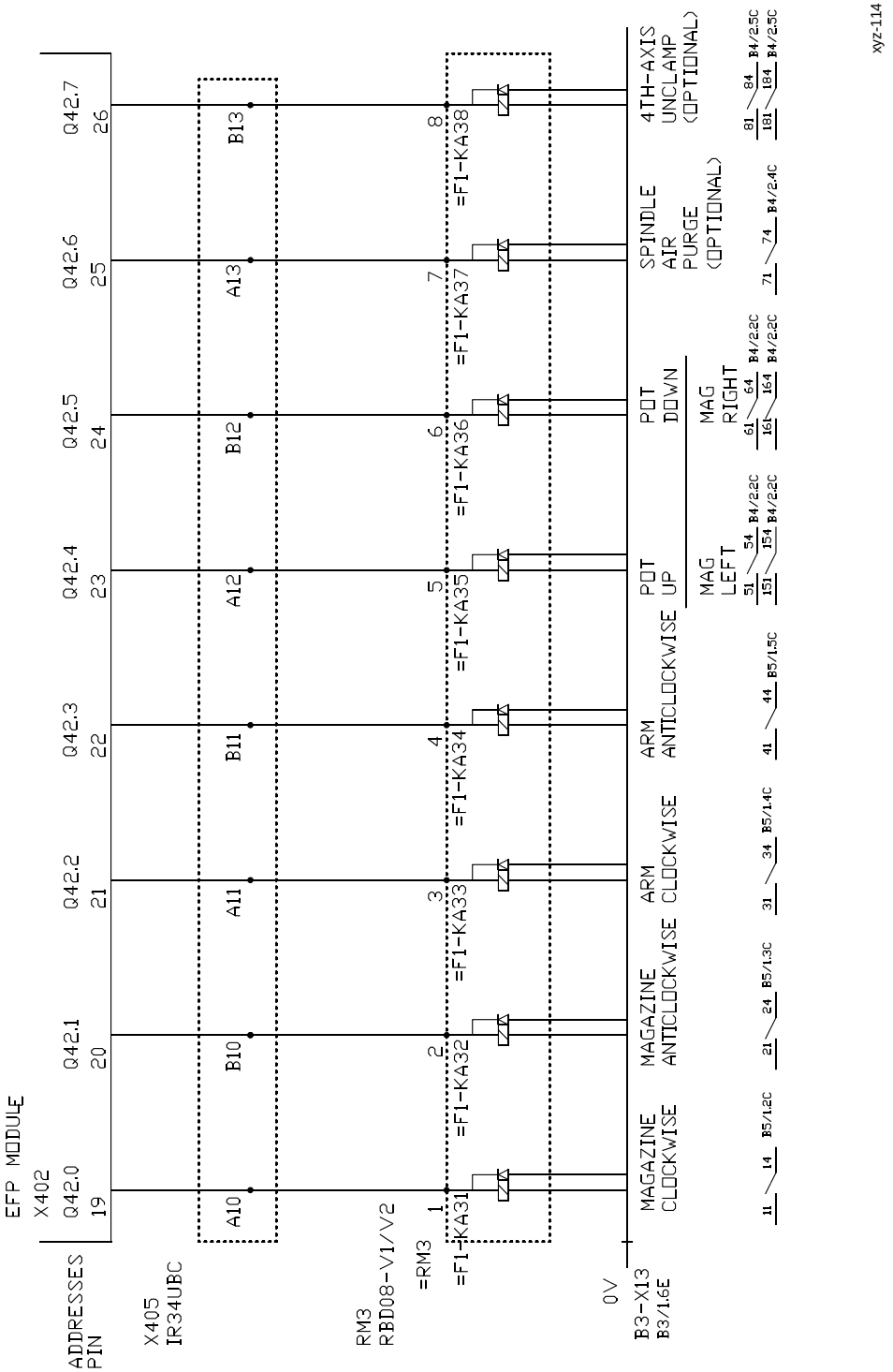

Figure 159 Output define

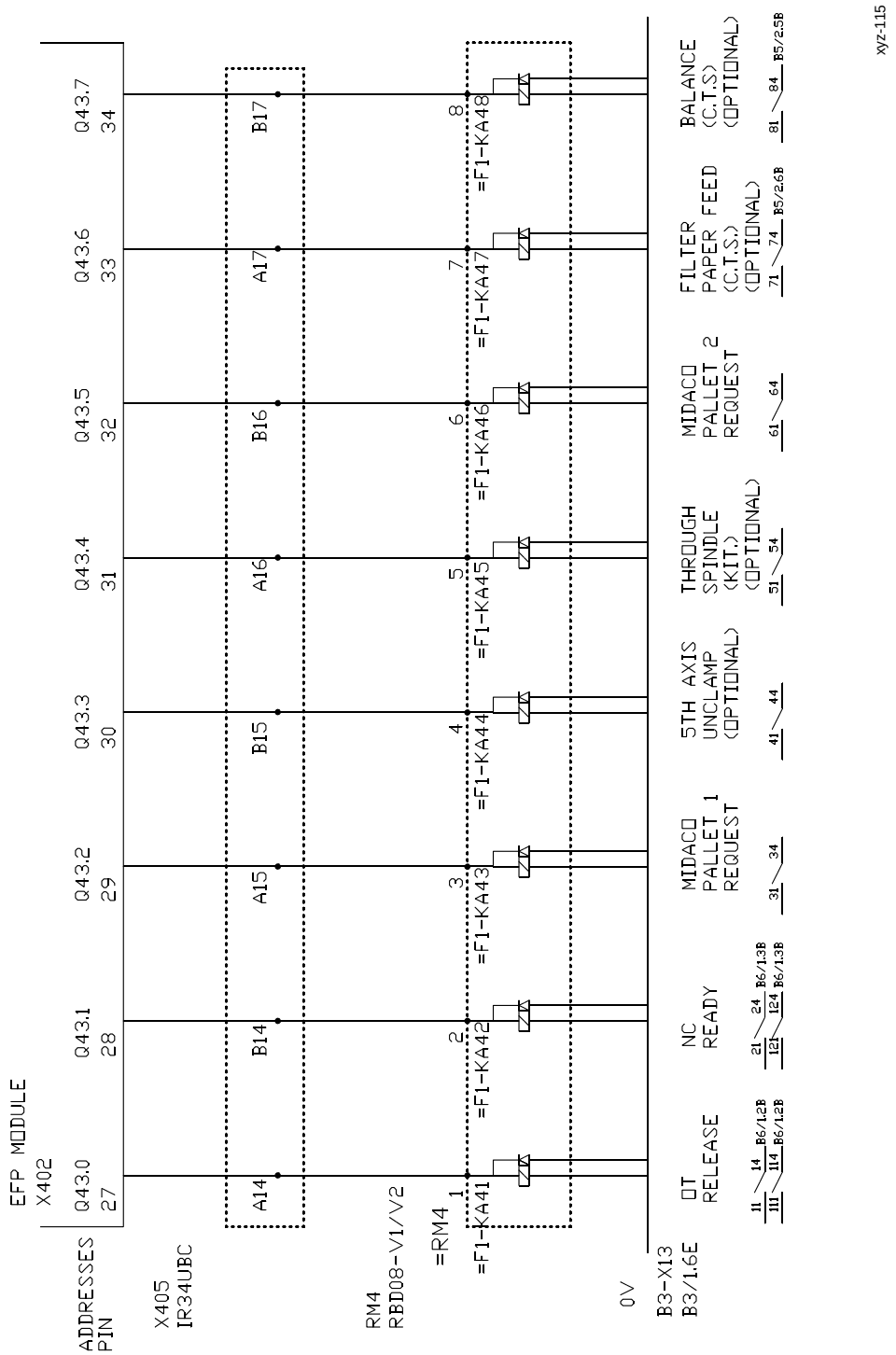

Figure 160 Output define

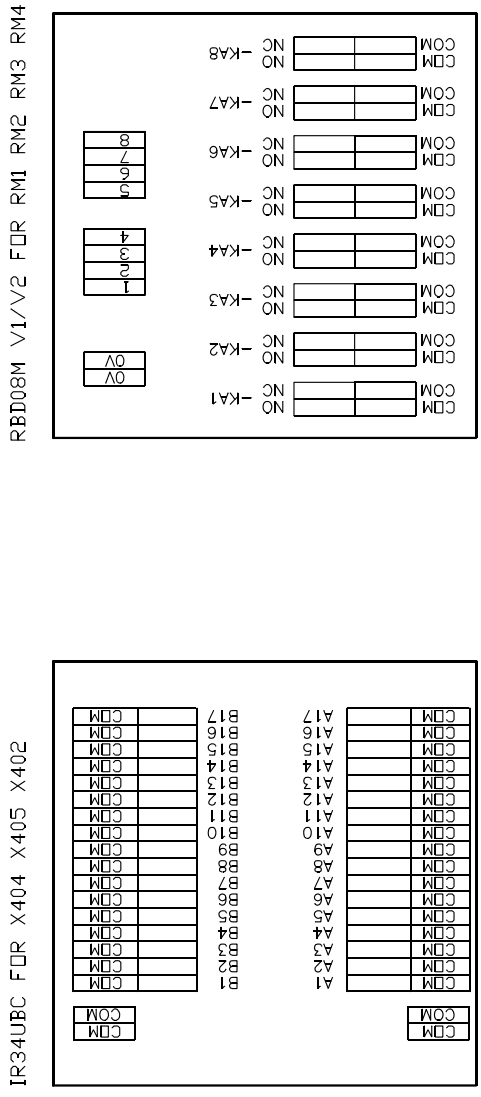

Figure 161 I/O PCB

EFP MODULE X404

PIN	PIN	SIGNAL	TYPE
1	A1	0V	
3	A2	I32.0	MAGAZINE COUNTER B
5	A3	I32.2	POCKET DOWN L.S (MAG RIGHT L.S)
7	A4	I32.4	ARM SENSOR B (MID)
9	A5	I32.6	MAGAZINE HOME SENSOR
11	A6	I33.0	RX
13	A7	I33.2	RZ
15	A8	I33.4	R5
17	A9	I33.6	TOOL UNCLAMP L.S
19	A10	I34.0	CTS. TANK HI LEVEL
21	A11	I34.2	COOLANT TANK HI LEVEL
23	A12	I34.4	CTS MASTER COOLANT PRESSURE LOW
25	A13	I34.6	SPACE
27	A14	I35.0	LUBE PRESSURE LOW
29	A15	I35.2	THROUGH SPINDLE PUMP OVLERLOAD
31	A16	I35.4	COOLANT PUMP OVERLOAD
33	A17	I35.6	ATC ARM OVERLOAD

PIN	PIN	SIGNAL	TYPE
2	B1		
4	B2	I32.1	POCKET UP L.S(MAG LEFT L.S)
6	B3	I32.3	ARM SENSOR A(LEFT)
8	B4	I32.5	ARM SENSOR C (RIGHT)
10	B5	I32.7	DETECT TOOLS IN SENSOR MAGAZINE COUNTER A
12	B6	I33.1	RY
14	B7	I33.3	R4
16	B8	I33.5	TOOL CLAMP L.S
18	B9	I33.7	TOOL UNCLAMP BUTTON
20	B10	I34.1	CTS. TANK LOW LEVEL
22	B11	I34.3	OIL COOLER ALARM
24	B12	I34.5	FRONT DOOR OPEN POS. DETECT LOCK
26	B13	I34.7	FRONT DOOR OPEN POS. DETECT CLOSE
28	B14	I35.1	5TH-AXIS CLAMP L.S
30	B15	I35.3	5TH-AXIS UNCLAMP L.S
32	B16	I35.5	MAGAZINE MOTOR OVERLOAD
34	B17	I35.7	OIL COOLER OVERLOAD

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Figure 162 Input list

EFP MODULE X405

PIN	PIN	SIGNAL	TYPE	PIN	PIN	SIGNAL	TYPE
1	A1			2	B1		
3	A2	I36.0	CHIP CLEAN OVERLOAD	4	B2	I36.1	4TH-AXIS CLAMP L.S
5	A3	I36.2	4TH-AXIS UNCLAMP L.S	6	B3	I36.3	C.T.S BALANCE PUMP OVERLOAD
7	A4	I36.4	CHIP CONVEYOR OVERLOAD	8	B4	I36.5	LUBE LEVEL LOW
9	A5	I36.6	AIR PRESSURE LOW	10	B5	I36.7	COOLANT LOW LEVEL
11	A6	I37.0	4 AXIS +DT	12	B6	I37.1	4 AXIS -DT
13	A7	I37.2	Z-AXIS AIR BALANCE PRESSURE LOW	14	B7	I37.3	I/R MODULR READY
15	A8	I37.4	X - DT AXIS	16	B8	I37.5	Y - DT AXIS
17	A9	I37.6	Z - DT AXIS	18	B9	I37.7	SPACE
19	A10	I38.0	SIEMENS MINI BHG ENABLE BUTTON	20	B10	I38.1	SIEMENS MINI BHG AXIS BIT2
21	A11	I38.2	SIEMENS MINI BHG AXIS BIT1	22	B11	I38.3	SIEMENS MINI BHG AXIS BIT0
23	A12	I38.4	SIEMENS MINI BHG RAPID KEY	24	B12	I38.5	SIEMENS MINI BHG PLUS KEY
25	A13	I38.6	SIEMENS MINI BHG MINUS KEY	26	B13	I38.7	SIEMENS MINI BHG F1 KEY
27	A14	I39.0	AXIS DT INPUT	28	B14	I39.1	EMG-STOP INPUT
29	A15	I39.2	SPACE	30	B15	I39.3	DT RELEASE INPUT
31	A16	I39.4	MIDACO PALLET CHANGE ACKNOWLEDGE	32	B16	I39.5	SIEMENS MINI BHG F2 KEY
33	A17	I39.6	SIEMENS MINI BHG F3 KEY	34	B17	I39.7	SPACE

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Figure 163 Input list

EFP MODULE X402

PIN	PIN	SIGNAL	TYPE	RELAY	PIN	PIN	SIGNAL	TYPE	RELAY
1	A1				2	B1			
3	A2	Q40.0	TOOL UNCLAMP	KA11	4	B2	Q40.1	TOOL BLAST	KA12
5	A3	Q40.2	ALARM (RED)	KA13	6	B3	Q40.3	ALARM (YELLOW)	KA14
7	A4	Q40.4	ALARM (GREEN)	KA15	8	B4	Q40.5	MIST	KA16
9	A5	Q40.6	DOOR OPEN	KA17	10	B5	Q40.7	AUTO POWER OFF	KA18
11	A6	Q41.1	LUBE	KA21	12	B6	Q41.1	WORKING LIGHT	KA22
13	A7	Q41.2	COOLANT PUMP	KA23	14	B7	Q41.3	CHIP CLEAN	KA24
15	A8	Q41.4	OIL COOLER	KA25	16	B8	Q41.5	CHIP CONVEYOR CLOCKWISE	KA26
17	A9	Q41.6	CHIP CONVEYOR ANTICLOCKWISE	KA27	18	B9	Q41.7	Z AXIS BREAKER	KA28
19	A10	Q42.0	MAGAZINE CLOCKWISE	KA31	20	B10	Q42.1	MAGAZINE ANTICLOCKWISE	KA32
21	A11	Q42.2	ARM CLOCKWISE	KA33	22	B11	Q42.3	ARM ANTICLOCKWISE	KA34
23	A12	Q42.4	POT UP/MAG LEFT	KA35	24	B12	Q42.5	POT DOWN/MAG RIGHT	KA36
25	A13	Q42.6	SPINDLE AIR PURGE	KA37	26	B13	Q42.7	4TH-AXIS UNCLAMP	KA38
27	A14	Q43.0	OT RELEASE	KA41	28	B14	Q43.1	NC READY	KA42
29	A15	Q43.2	MIDACO PALLET 1 REQUEST	KA43	30	B15	Q43.3	5TH AXIS UNCLAMP	KA44
31	A16	Q43.4	THROUGH SPINDLE (KIT)	KA45	32	B16	Q43.5	MIDACO PALLET 2 REQUEST	KA46
33	A17	Q43.6	FILTER PAPER FEED(C.T.S.)	KA47	34	B17	Q43.7	BALANCE(C.T.S.)	KA48

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Figure 164 Output list

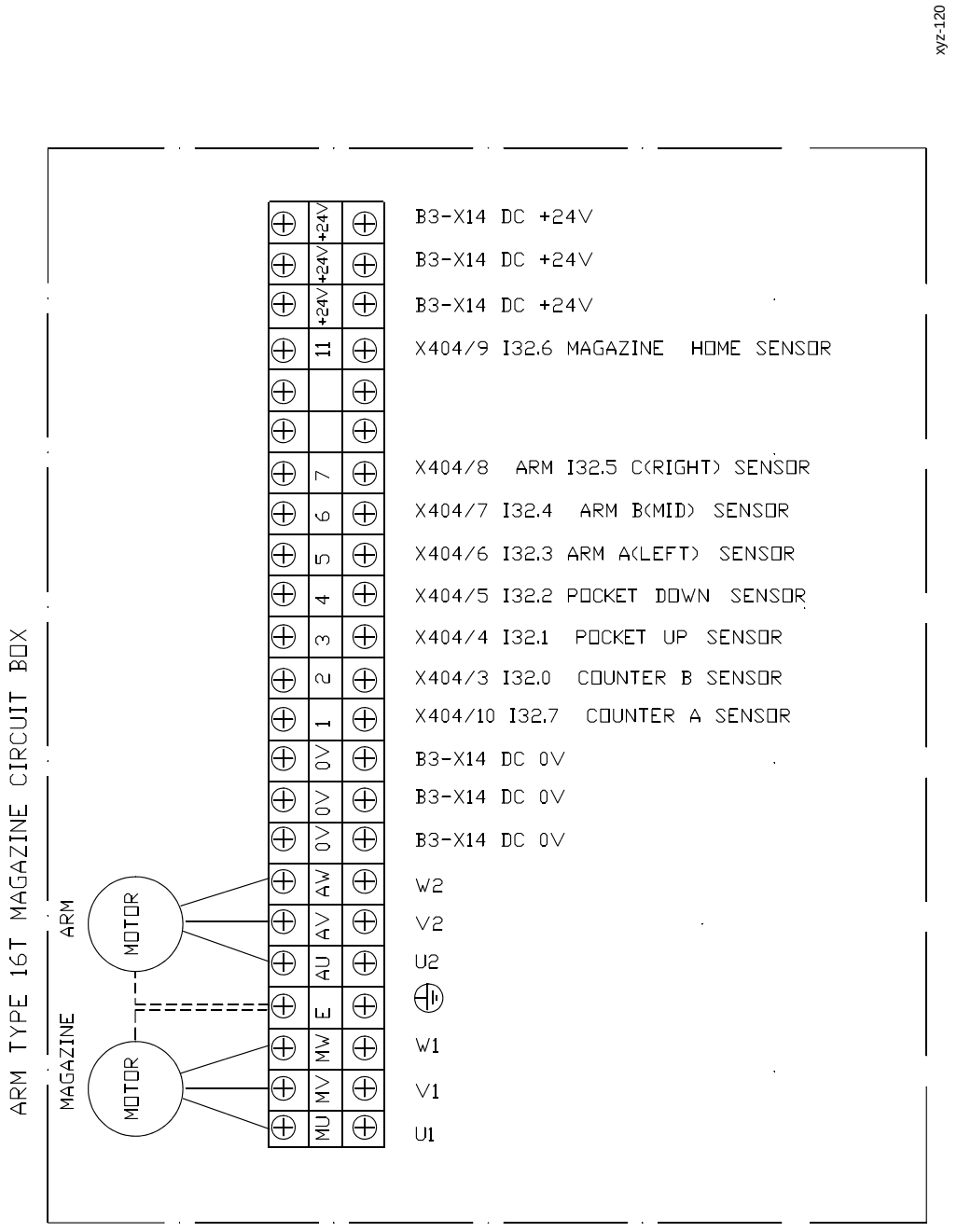


Figure 165 Arm type

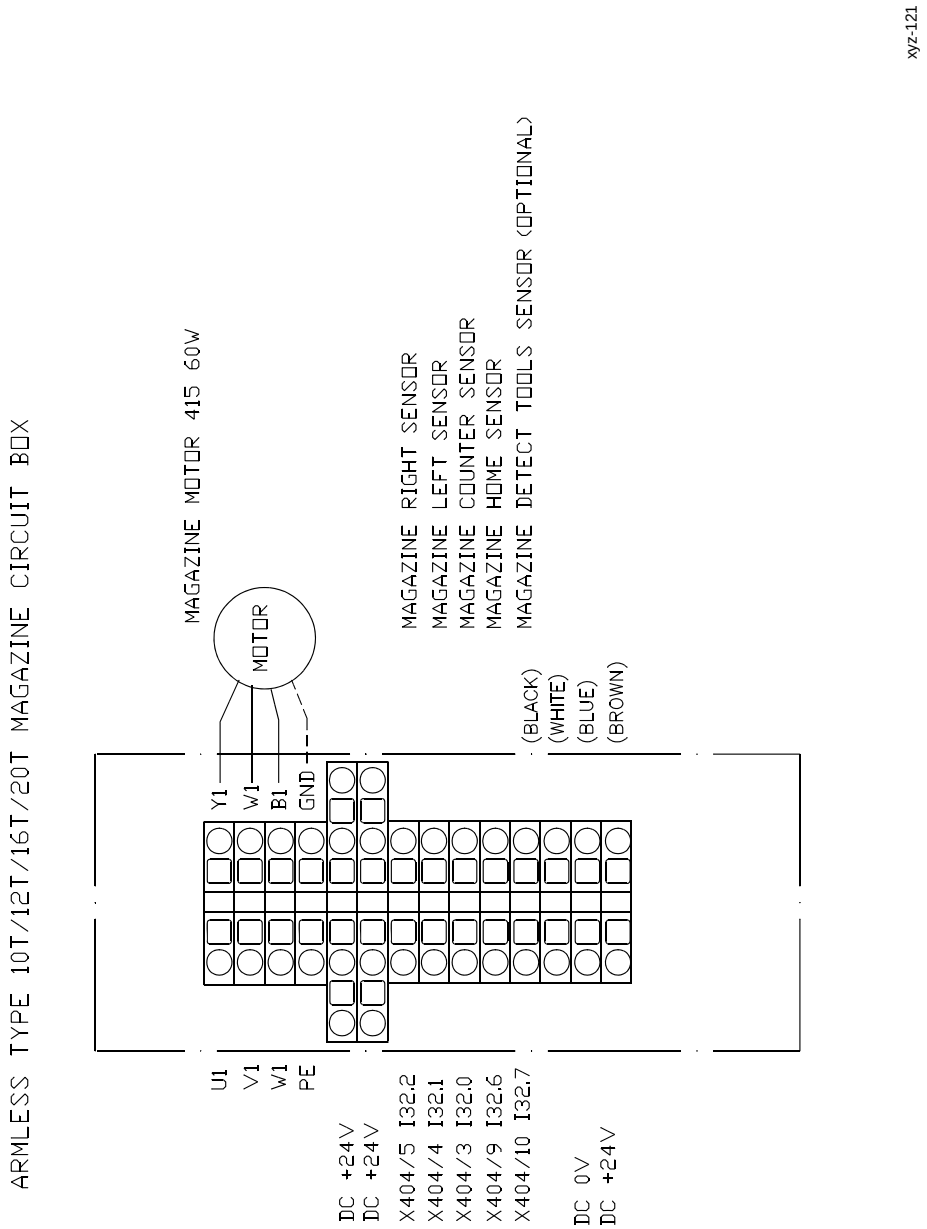


Figure 166 Armless type

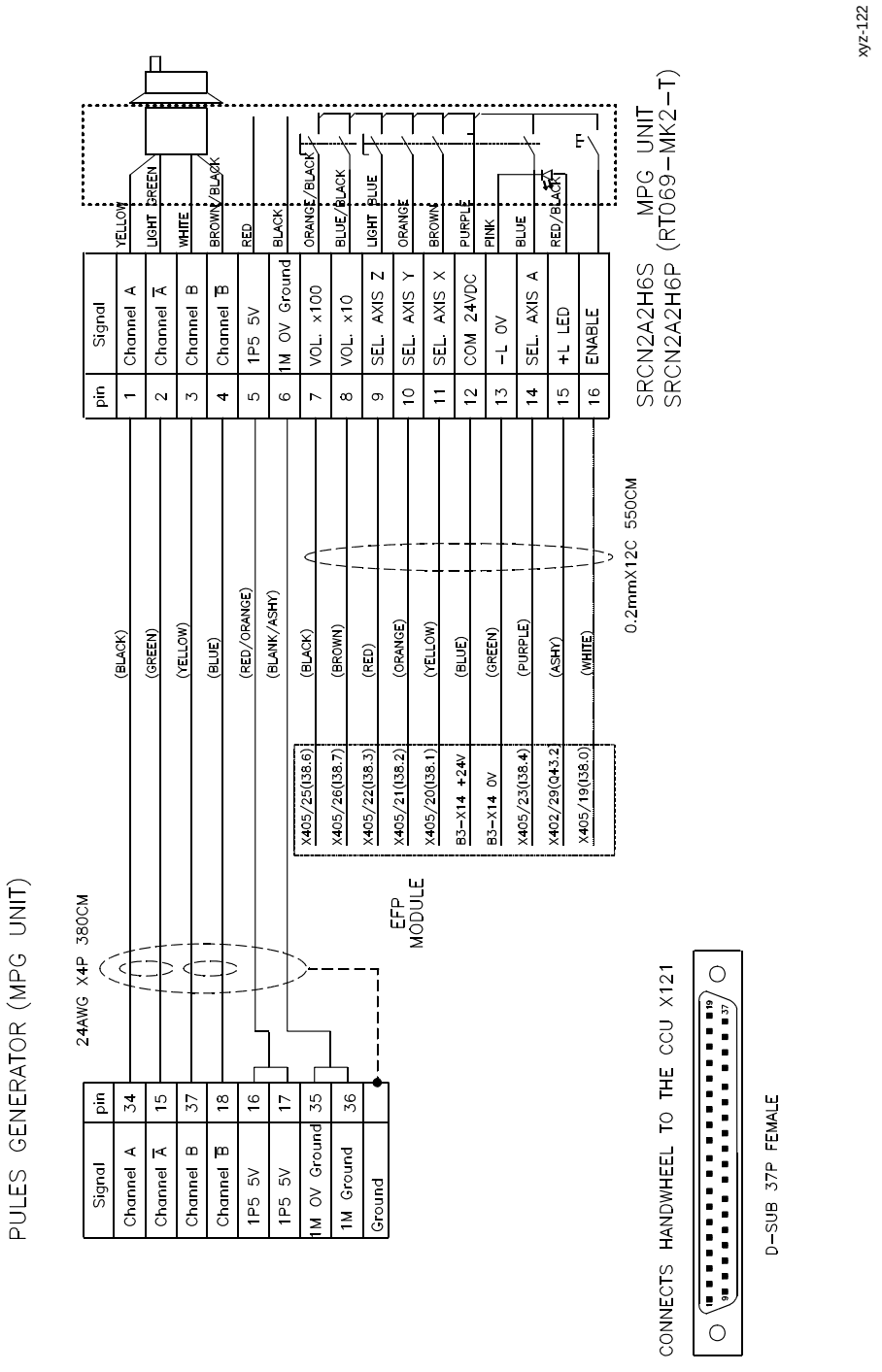


Figure 167 MPG unit

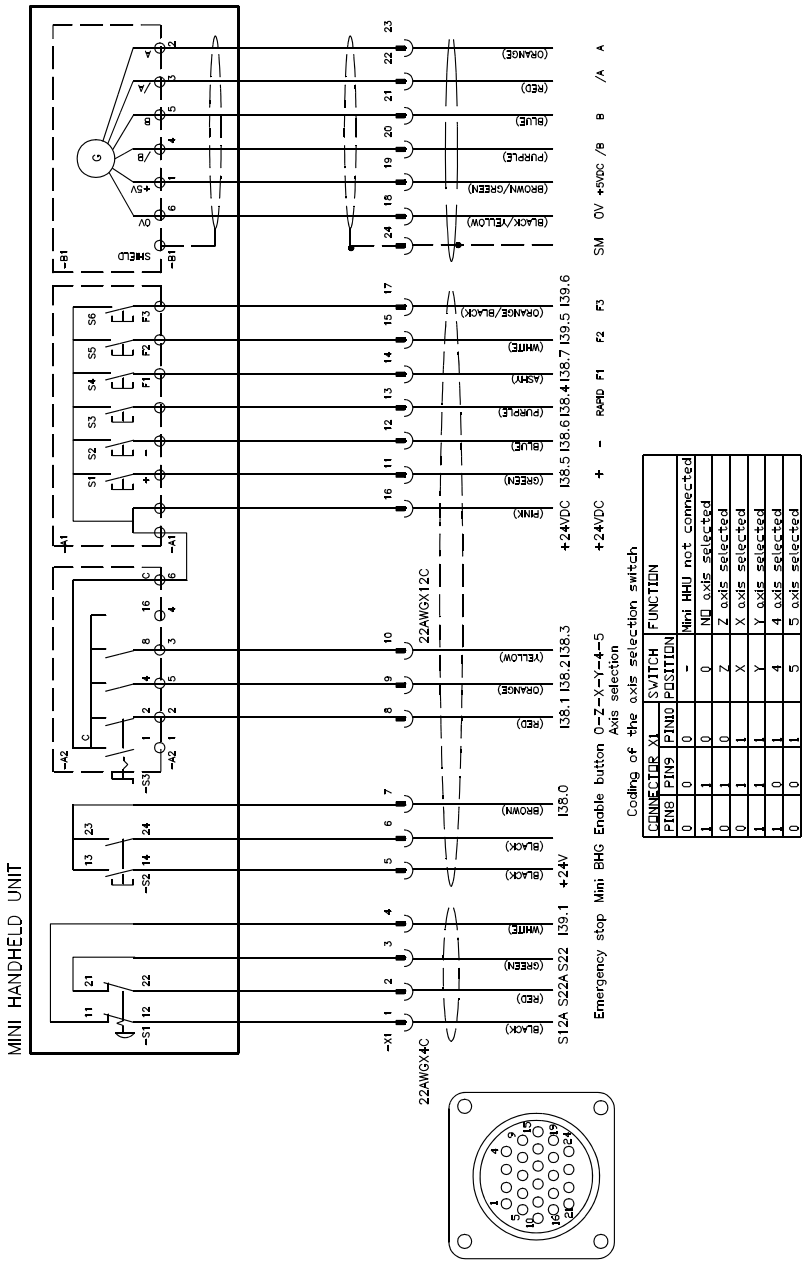

MINI HANDHELD UNIT
Emergency stop
Mini BHG Enable button
0-Z-X-Y-4-5 Axis selection
Coding of the axis selection switch
CONNECTOR X1
PIN8 PIN9 PIN10
SWITCH POSITION
FUNCTION
0 0 0 - Mini HHU not connected
1 1 0 0 NO axis selected
0 1 0 Z Z axis selected
0 1 1 X X axis selected
1 1 1 Y Y axis selected
1 0 1 4 4 axis selected
0 0 1 5 5 axis selected
22AWGX4C
22AWGX12C
S12A S22A S22 I39.1 +24V I38.0 I38.1 I38.2 I38.3 +24VDC I38.5 I38.6 I38.4 I38.7 I39.5 I39.6
SHIELD
+5V
0V
SM 0V +5VDC /B B /A A
F3 F2 F1 RAMP - + 24VDC
(BLACK) (RED) (GREEN) (WHITE) (BLACK) (BLACK) (BROWN) (RED) (ORANGE) (YELLOW) (PINK) (GREEN) (BLUE) (PURPLE) (GREY) (WHITE) (ORANGE/BLACK)
(BLACK/YELLOW) (BROWN/GREEN) (PURPLE) (BLUE) (RED) (ORANGE)

Figure 168 Mini BHG

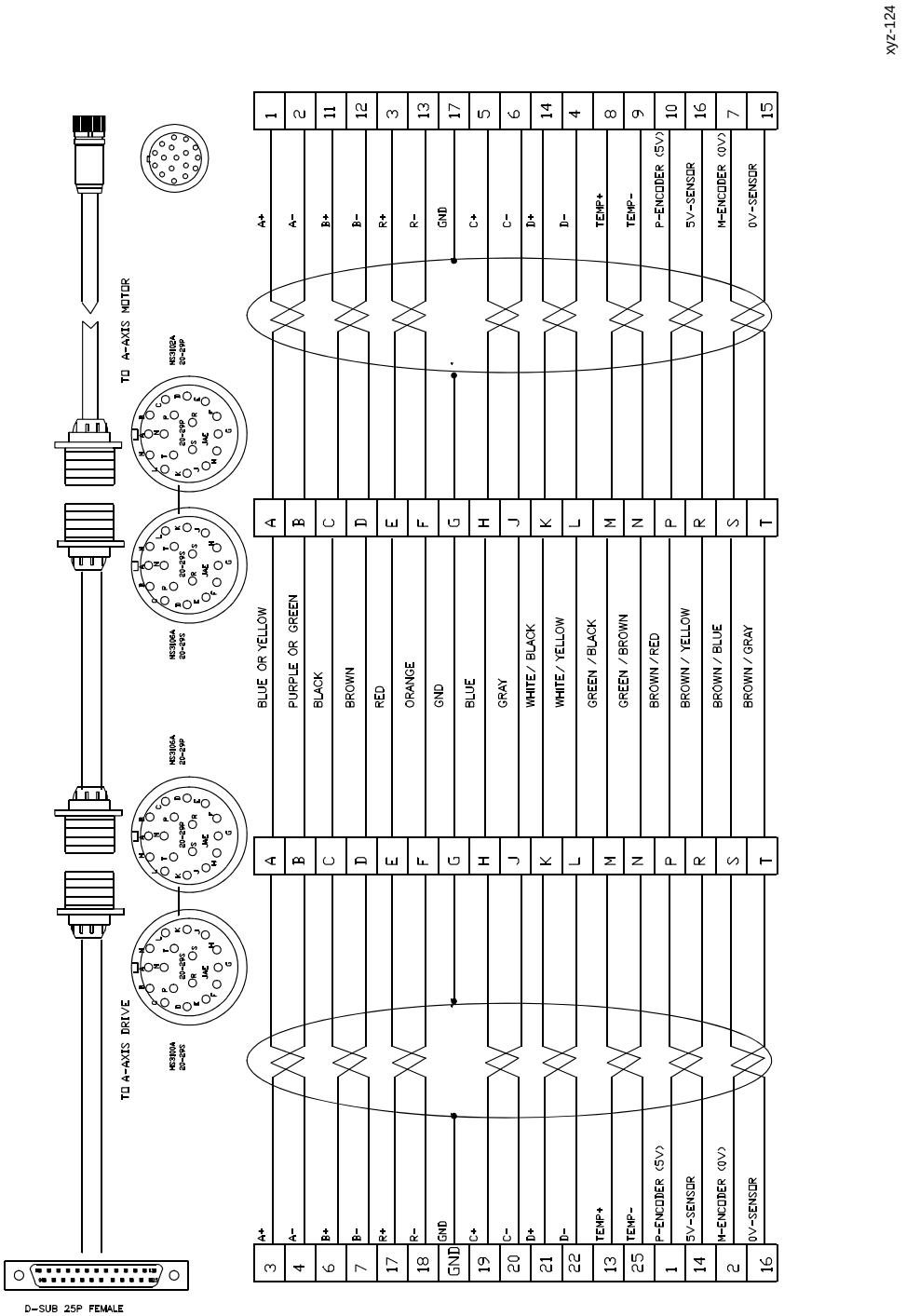


Figure 169 4th encoder

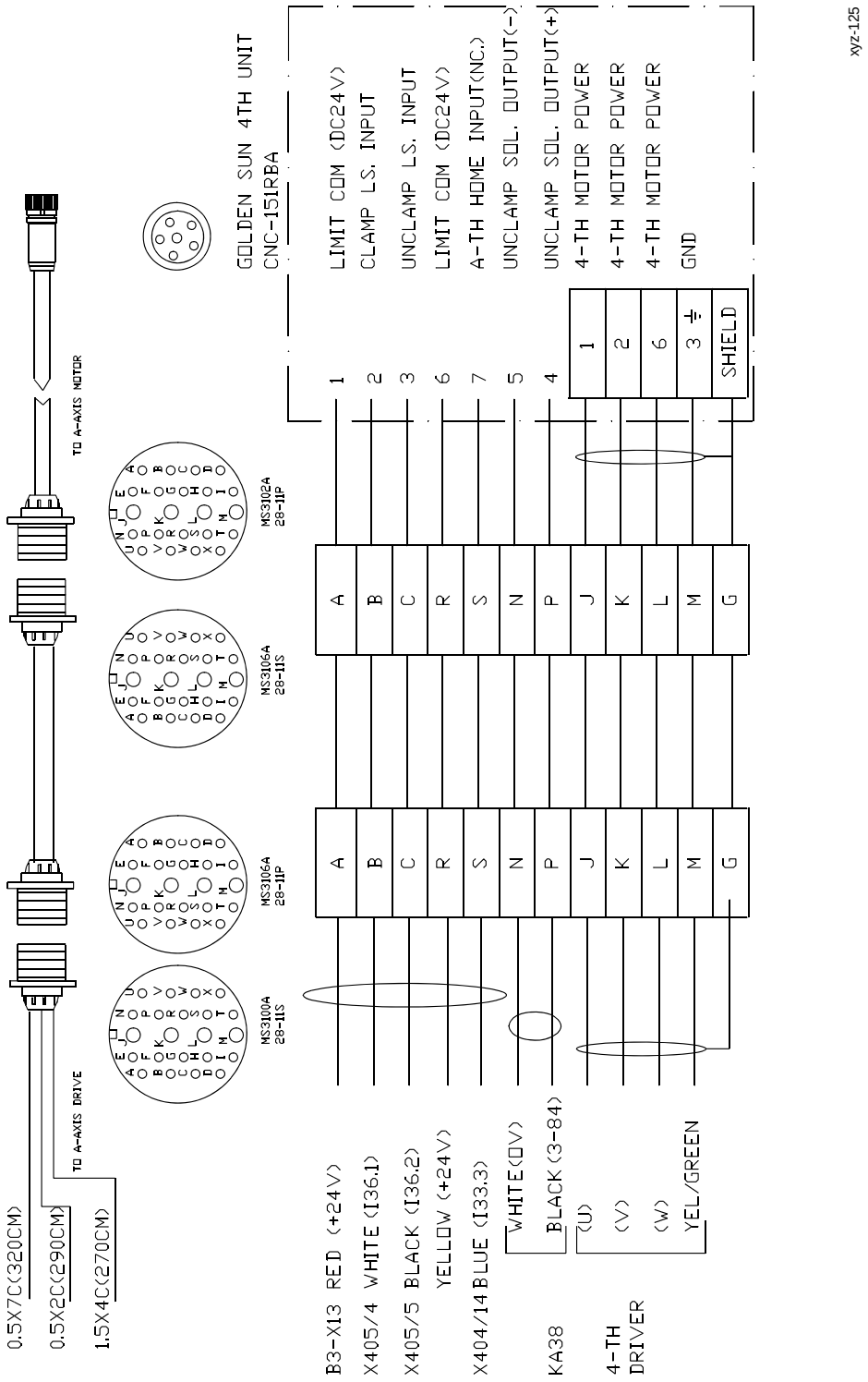


Figure 170 4th interface

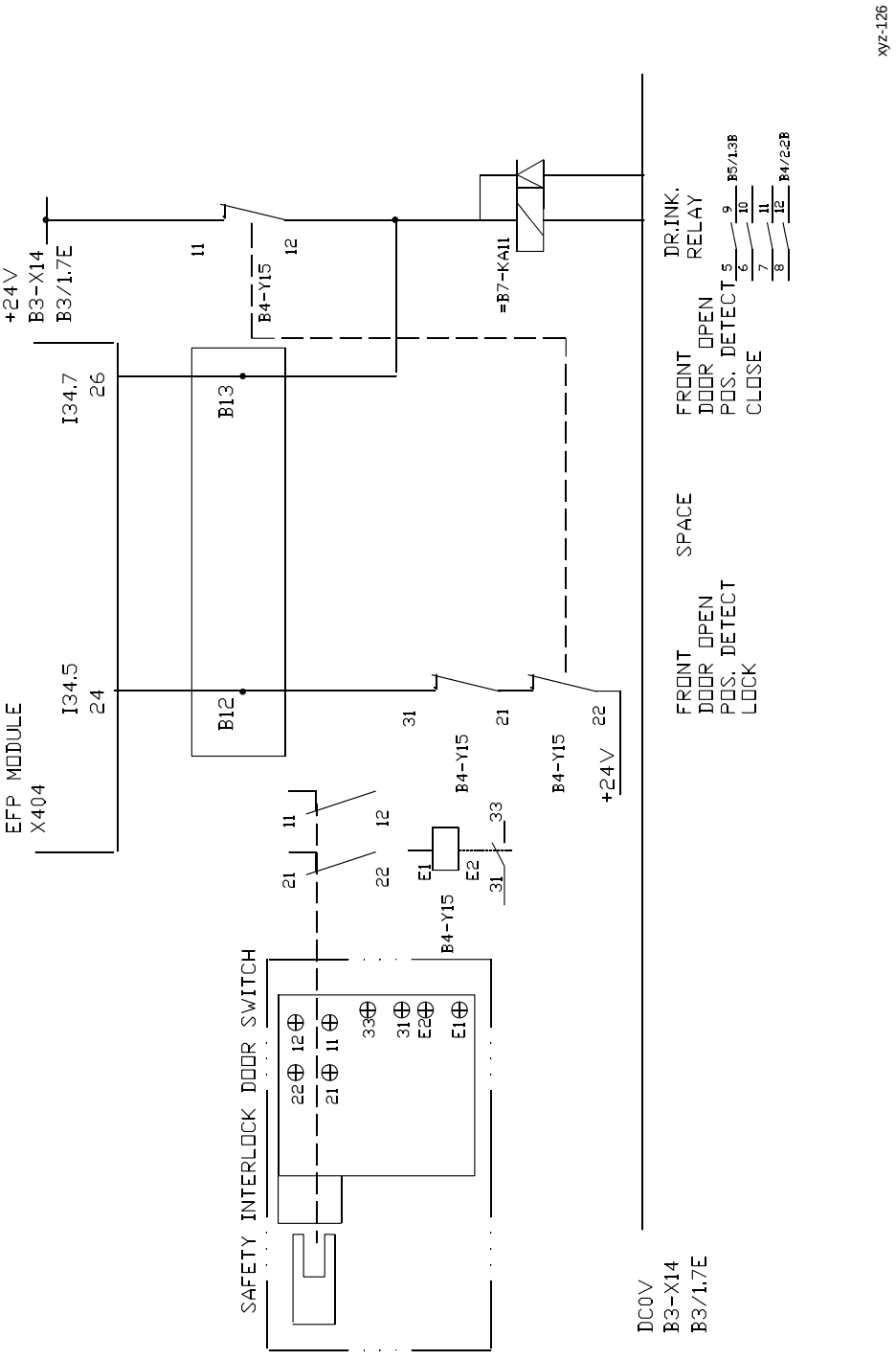


Figure 171 Interlock door

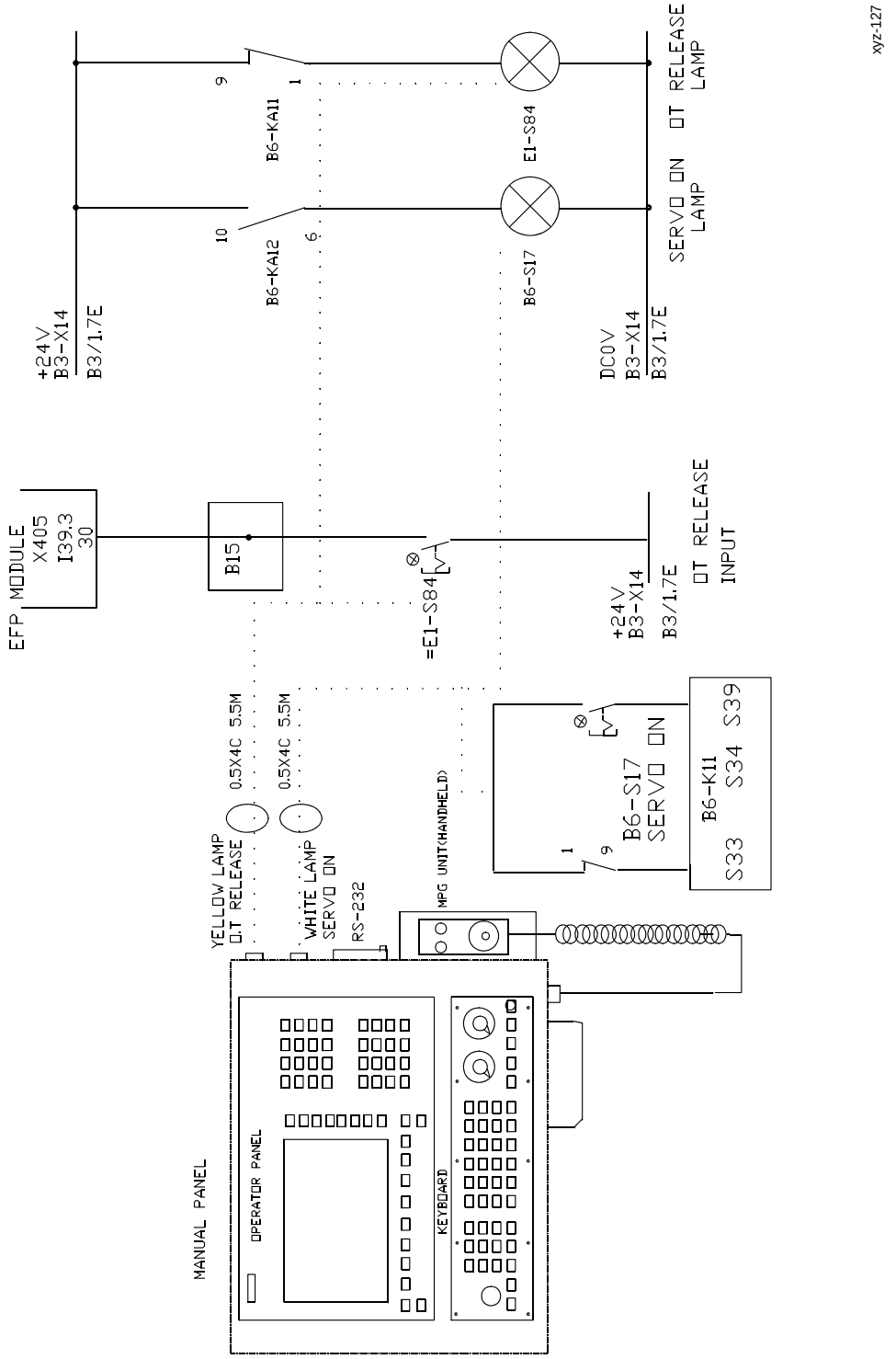


Figure 172 Servo and OT B.P.

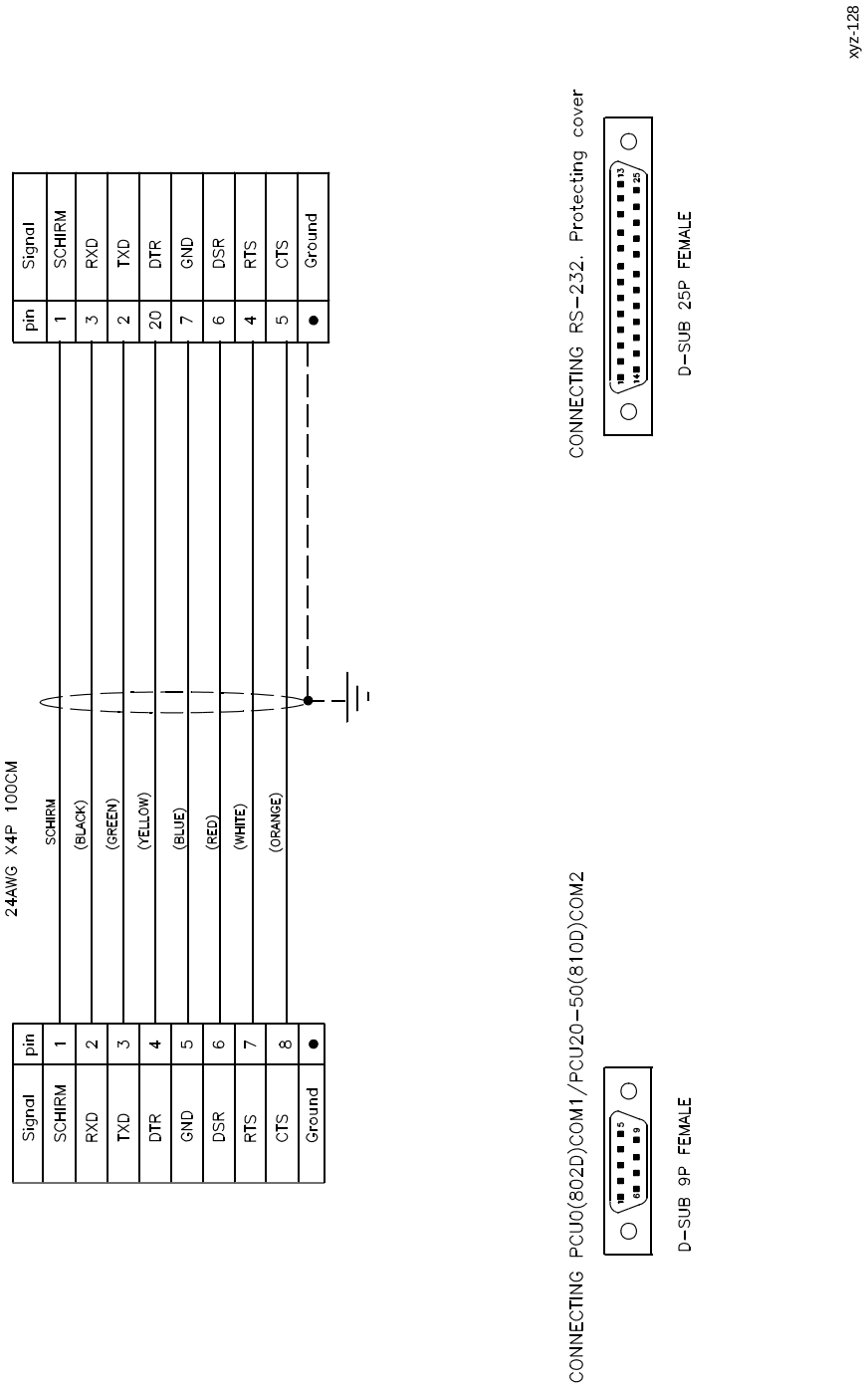


Figure 173 RS-232

Figure 174 X, Y axis limit

Figure 175 X, Y axis limit

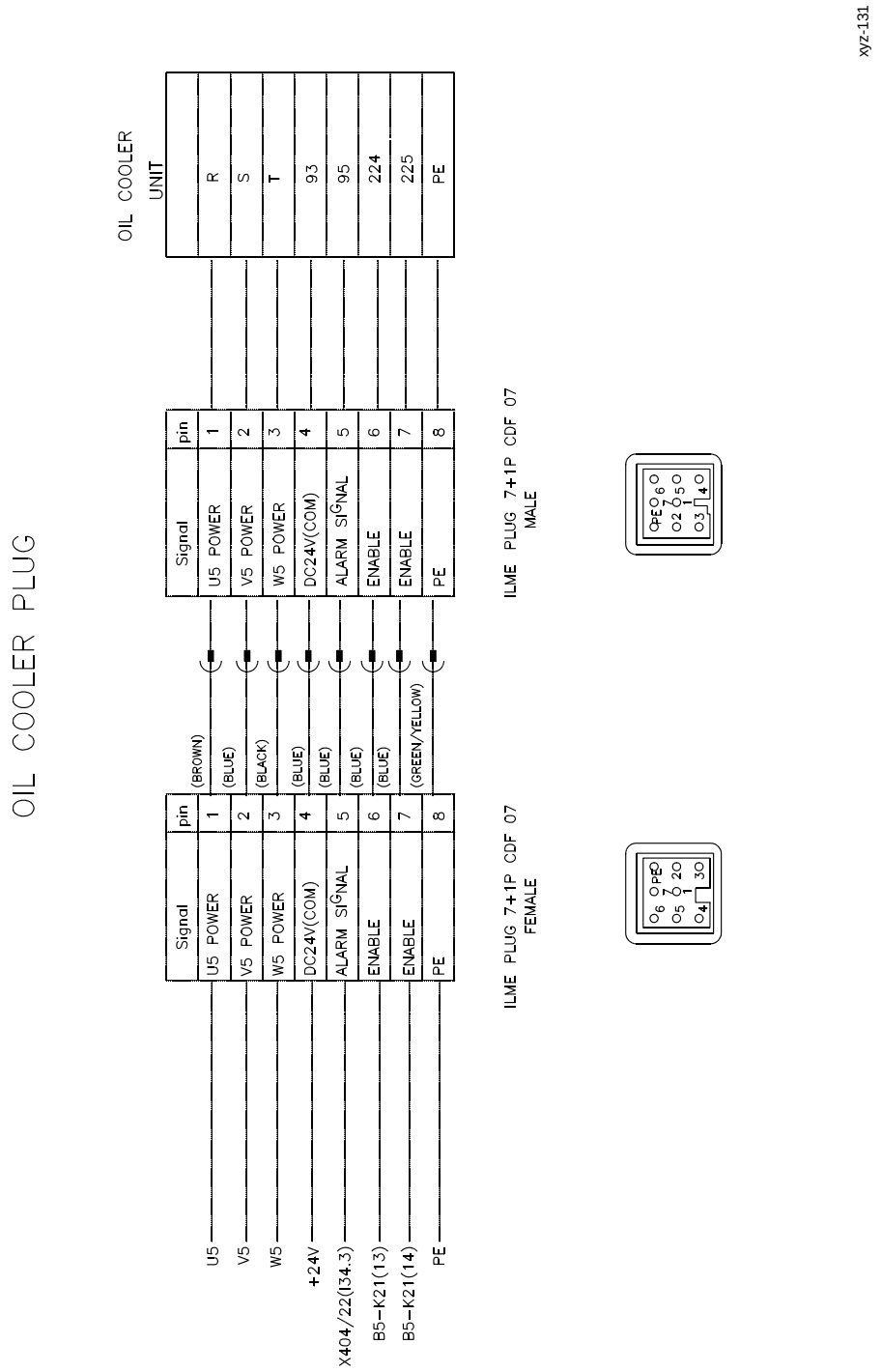


Figure 176 Oil cooler

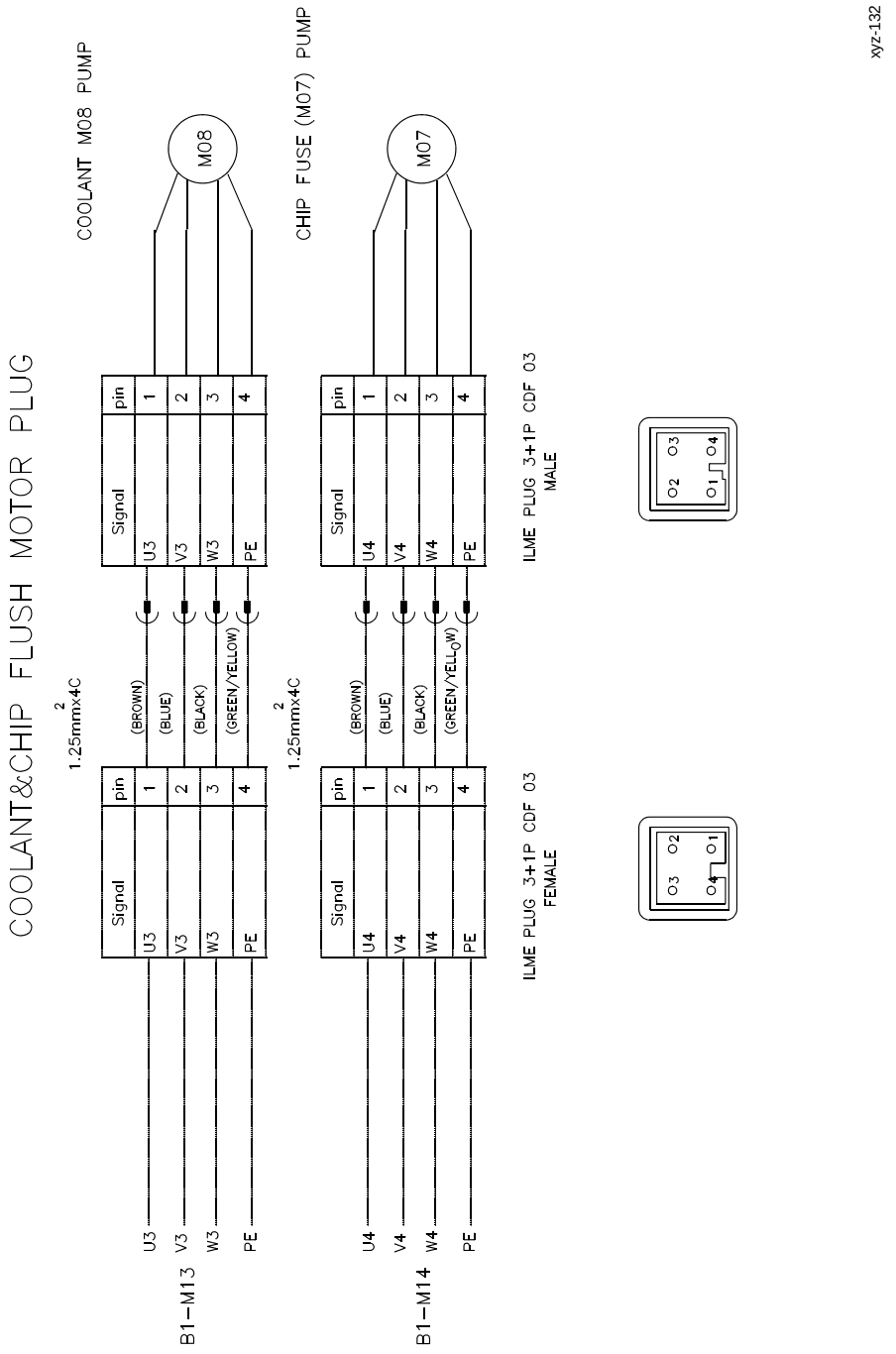


Figure 177 Motor plug

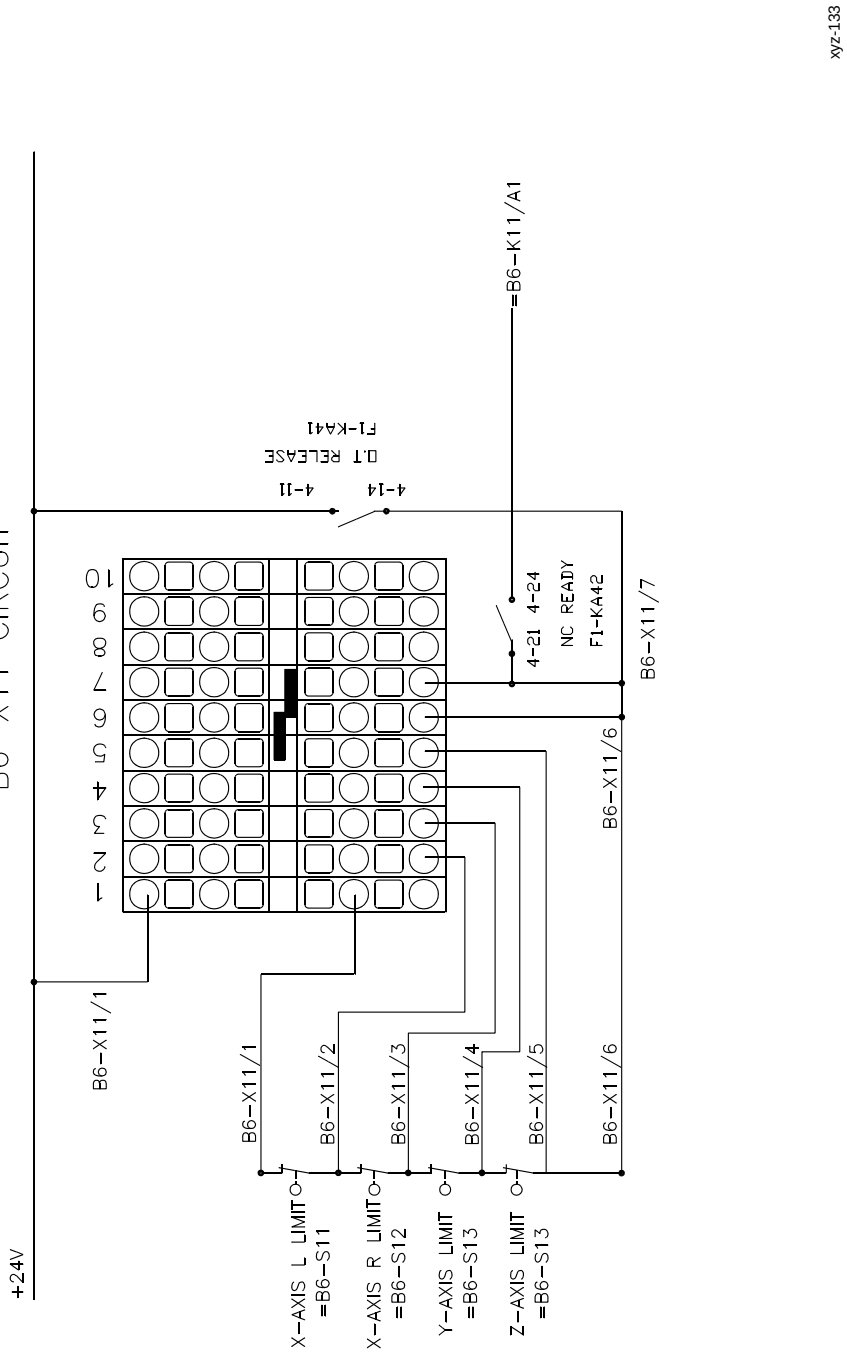


Figure 178 B6-X11 circuit

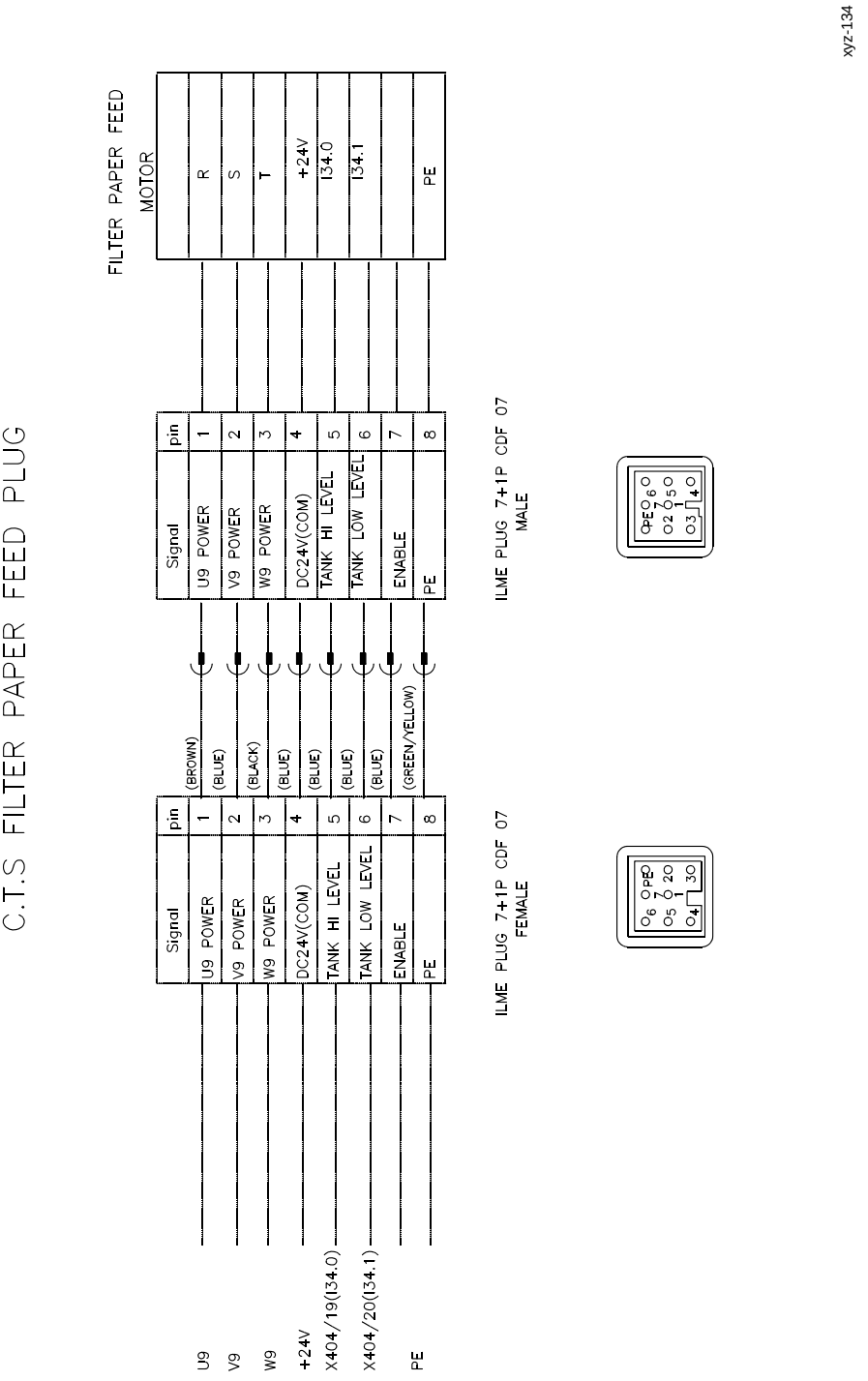


Figure 179 C.T.S. filter

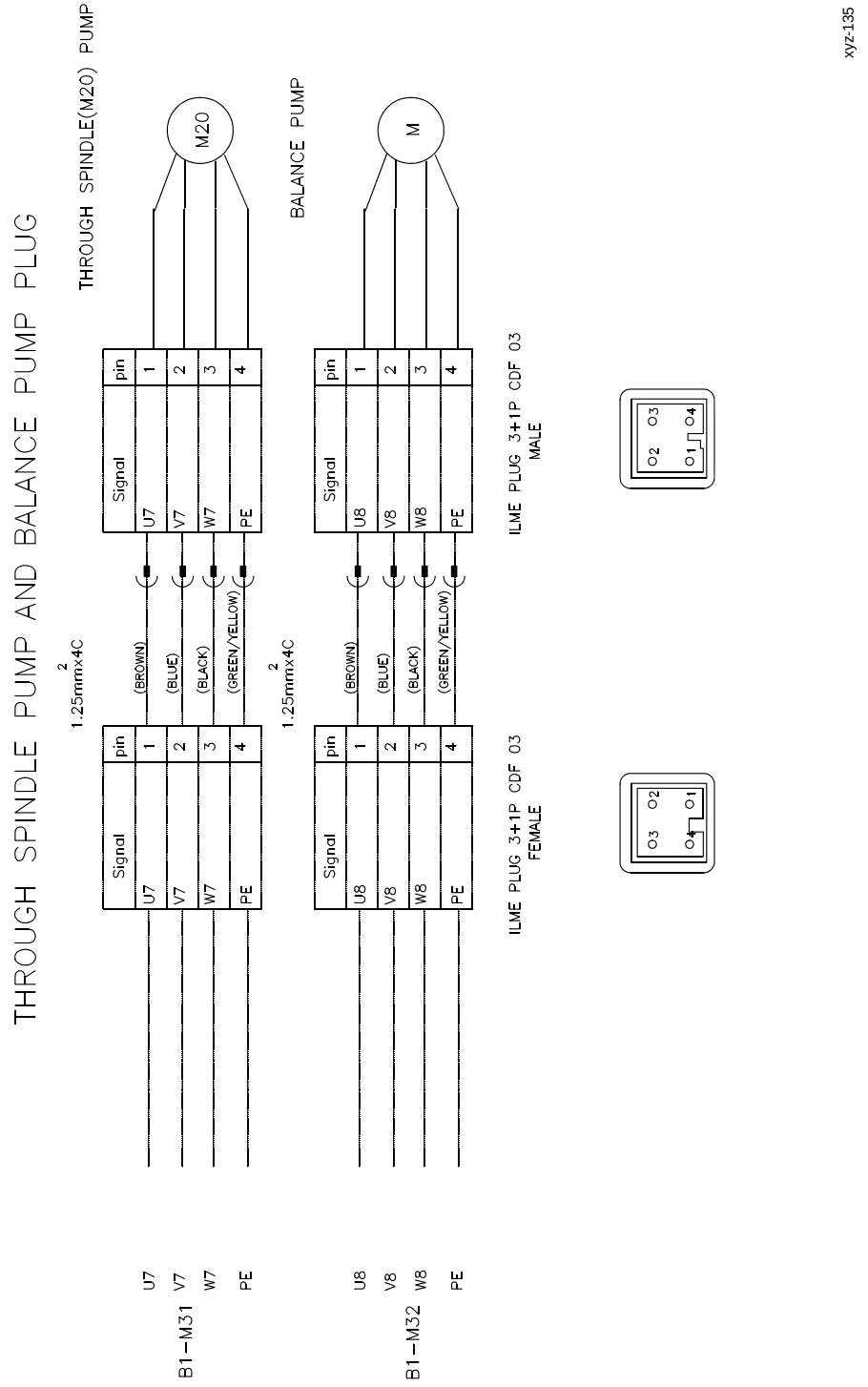
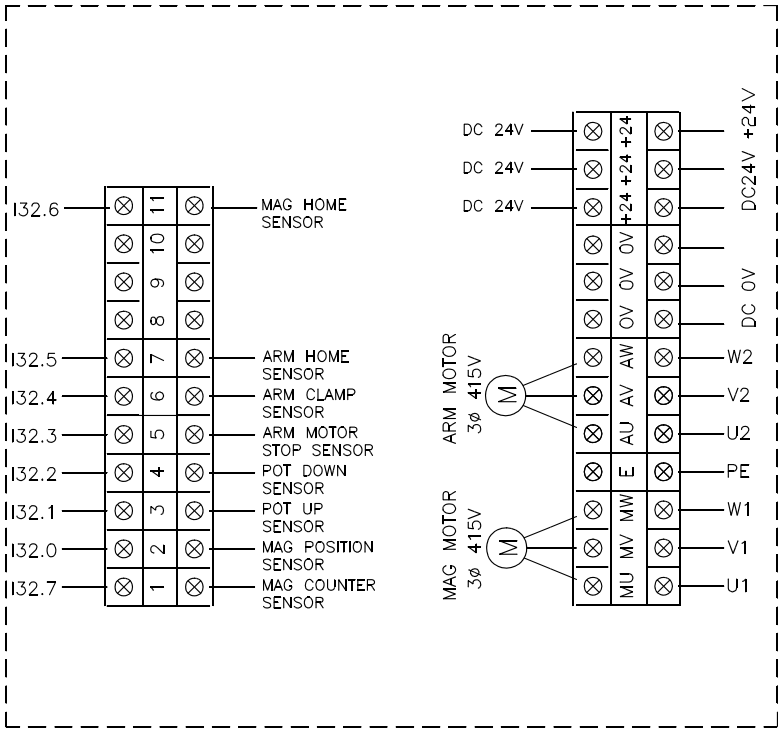


Figure 180 Motor plug

xyz-136



TYPE : ARM TYPE ATC
FOR
KR-MF710/ML1020

Figure 181 Arm type

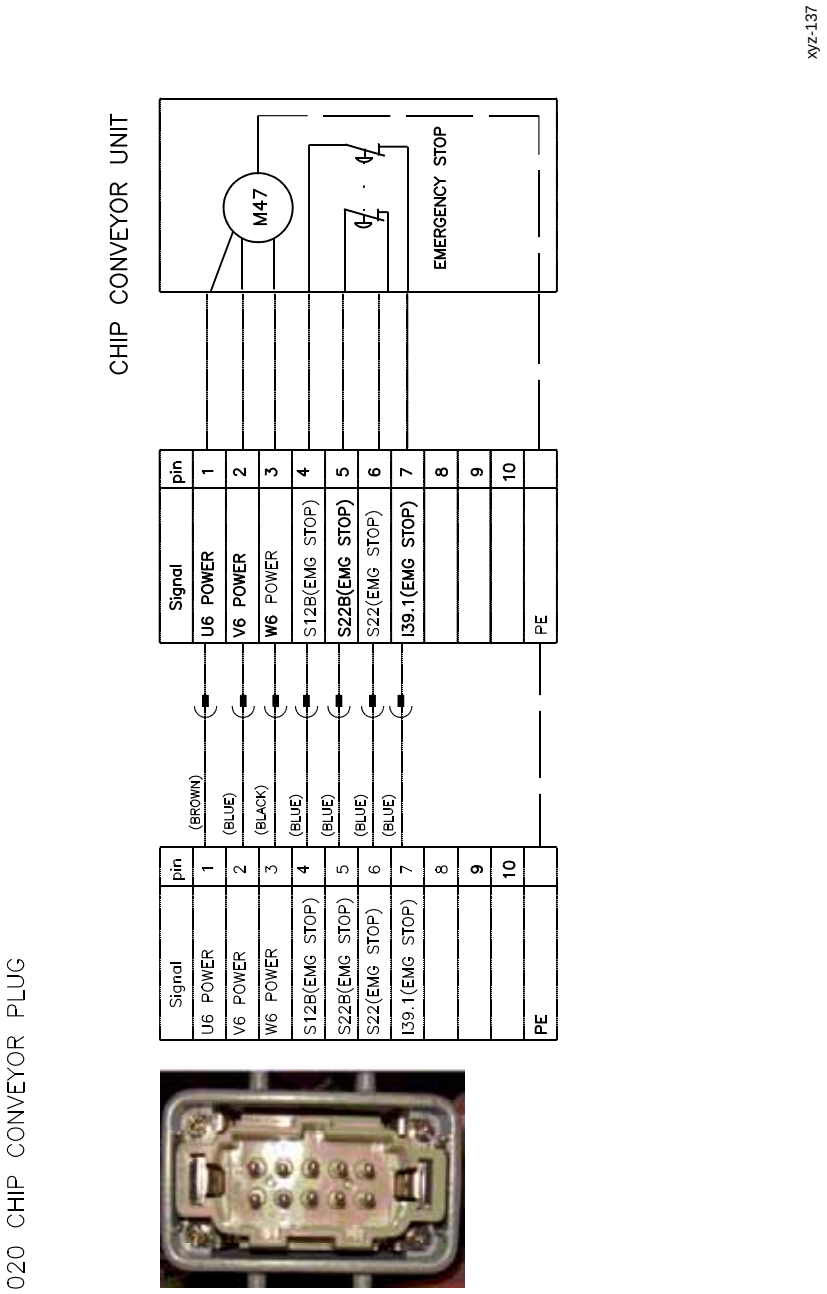


Figure 182 Chip conveyor

12.2 Rotary Tool Changer Wiring

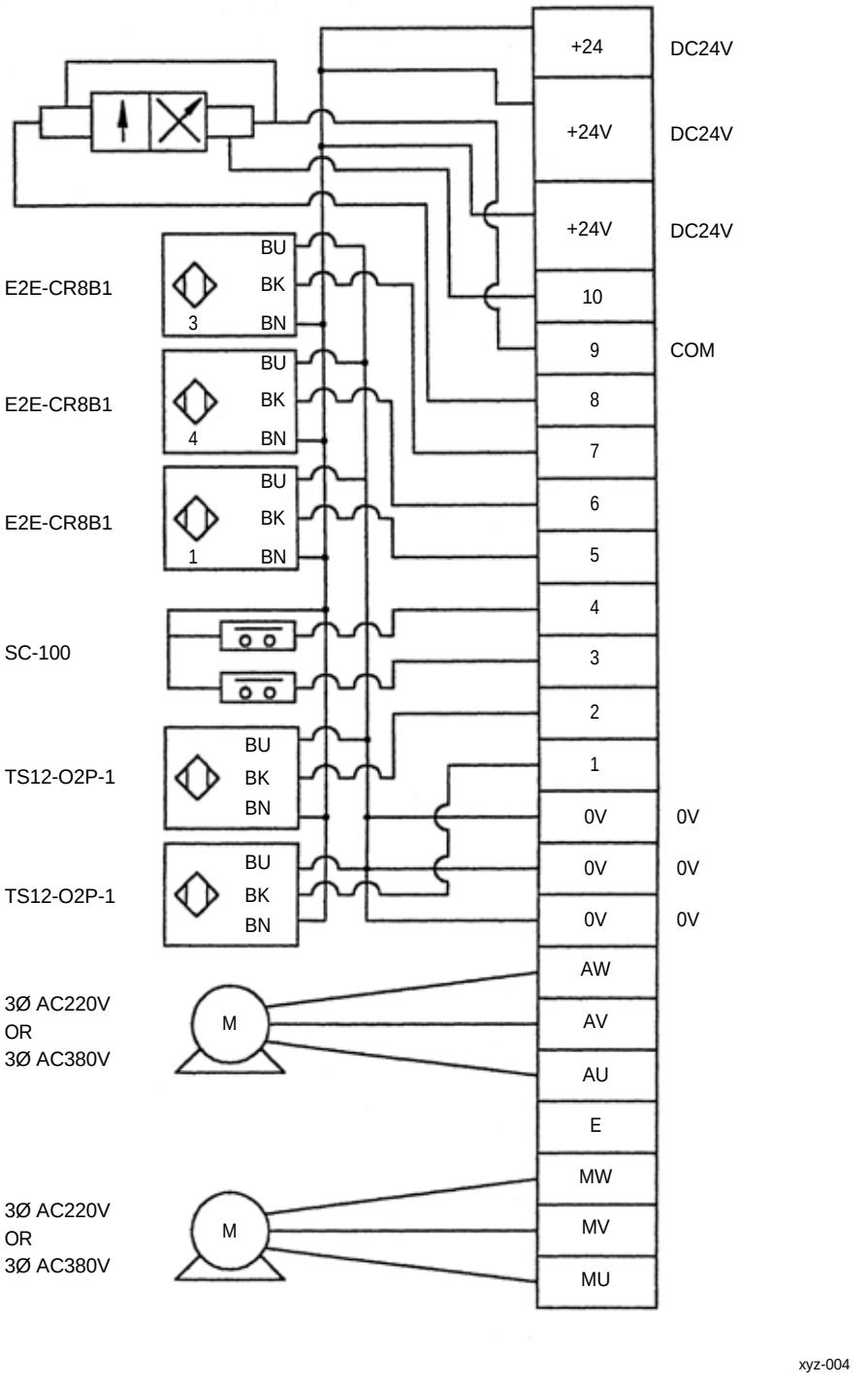


Figure 183 Rotary tool changer electrical diagram

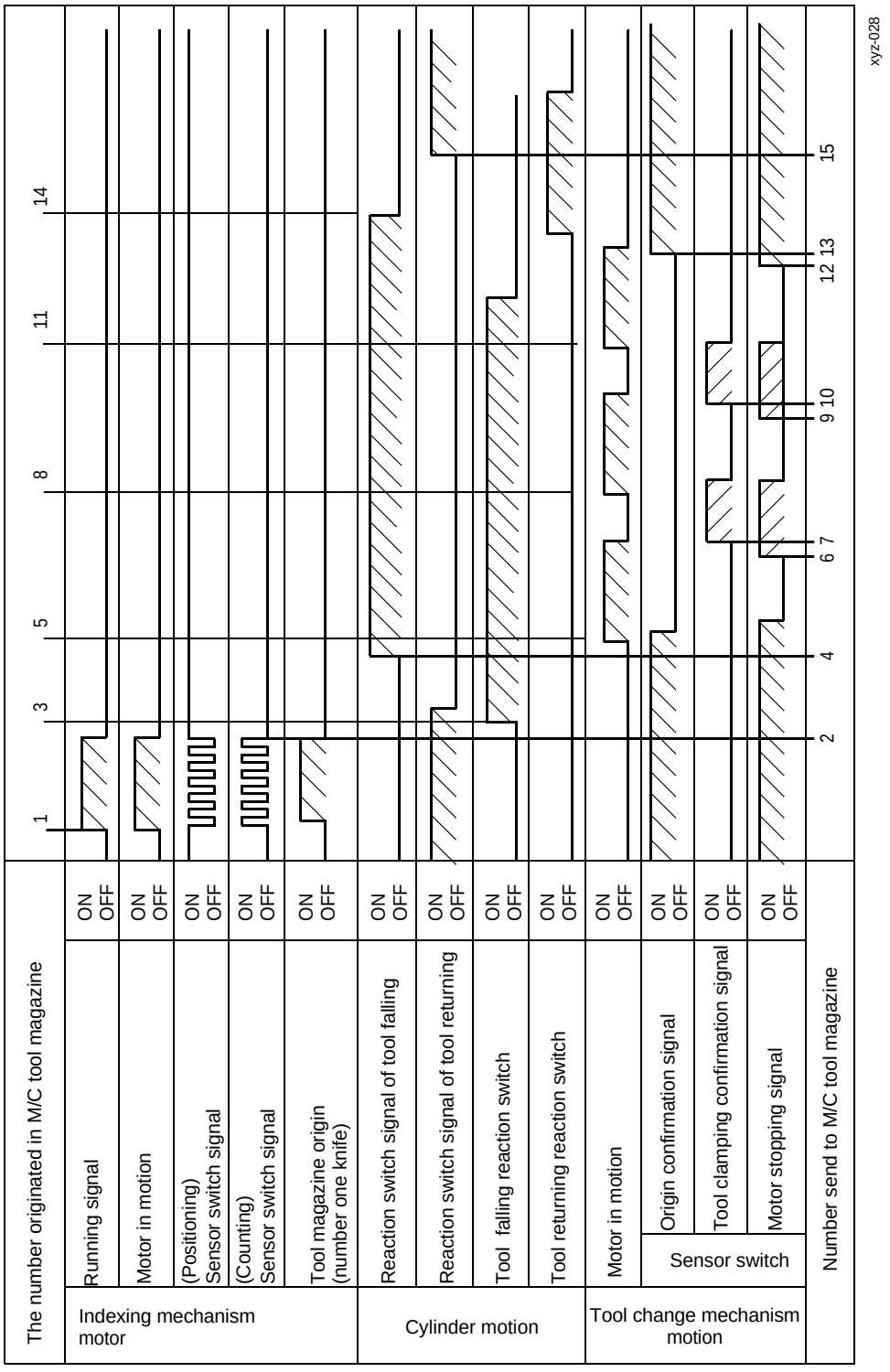


Figure 184 Electrical action sequence diagram

12.2.1 Electrical Action Sequence

Sequence No.	Action
1	Tool selection input (clockwise and anti-clockwise tool selection input).
2	Tool disk/tool chain counting and positioning signal (to position and stop the indexing mechanism motor).
3	Tool falling solenoid valve input.
4	Tool falling (cylinder retraction) positioning signal.
5	Motor operation input of tool change mechanism.
6	Motor stopping signal of tool change mechanism.
7	Tool change mechanism tool clamping confirmation and spindle pawl's tool releasing signal.
8	The spindle pawl releases the tool and the tool change mechanism motor then runs input.
9	Motor stopping signal of tool change mechanism.
10	Tool change mechanism's tool clamping confirmation and spindle pawl's tool clamping signal.
11	The spindle pawl releases the tool and the tool change mechanism motor then runs input.
12	Motor stopping signal of tool change mechanism.
13	Origin confirmation signal of tool change mechanism.
14	Tool returning solenoid valve input.
15	Tool returning (cylinder stretch) positioning signal.
16	The tool change is complete.

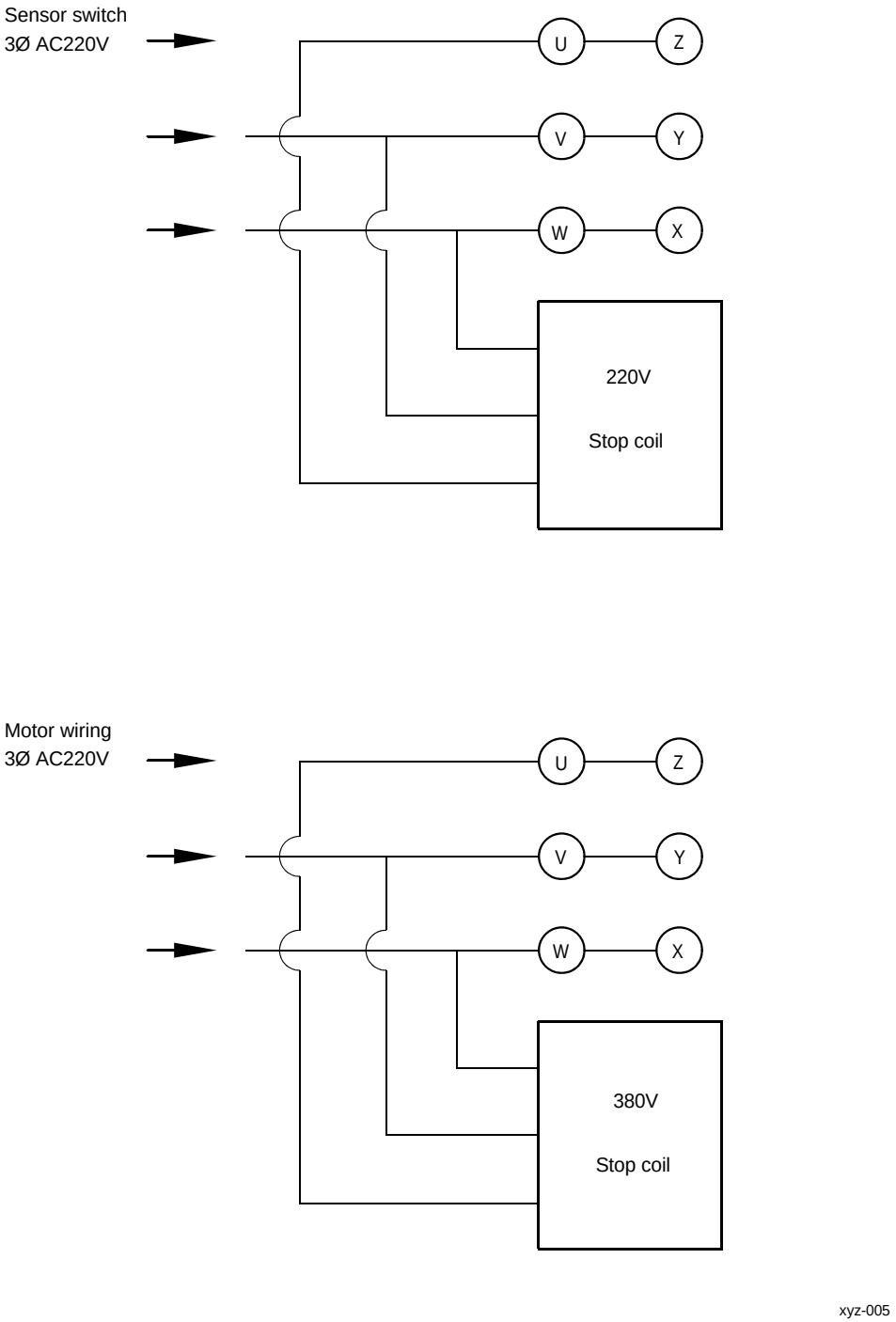


Figure 185 Motor wiring diagram

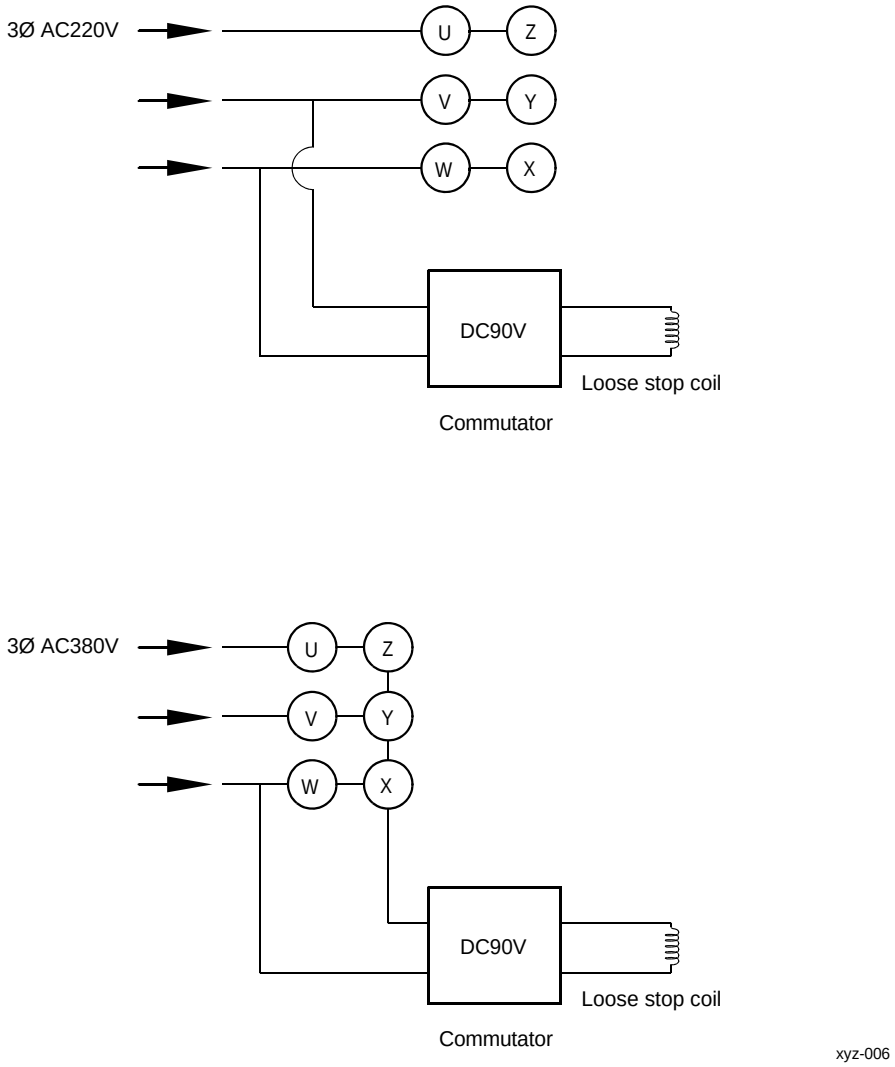


Figure 186 Motor to commutator

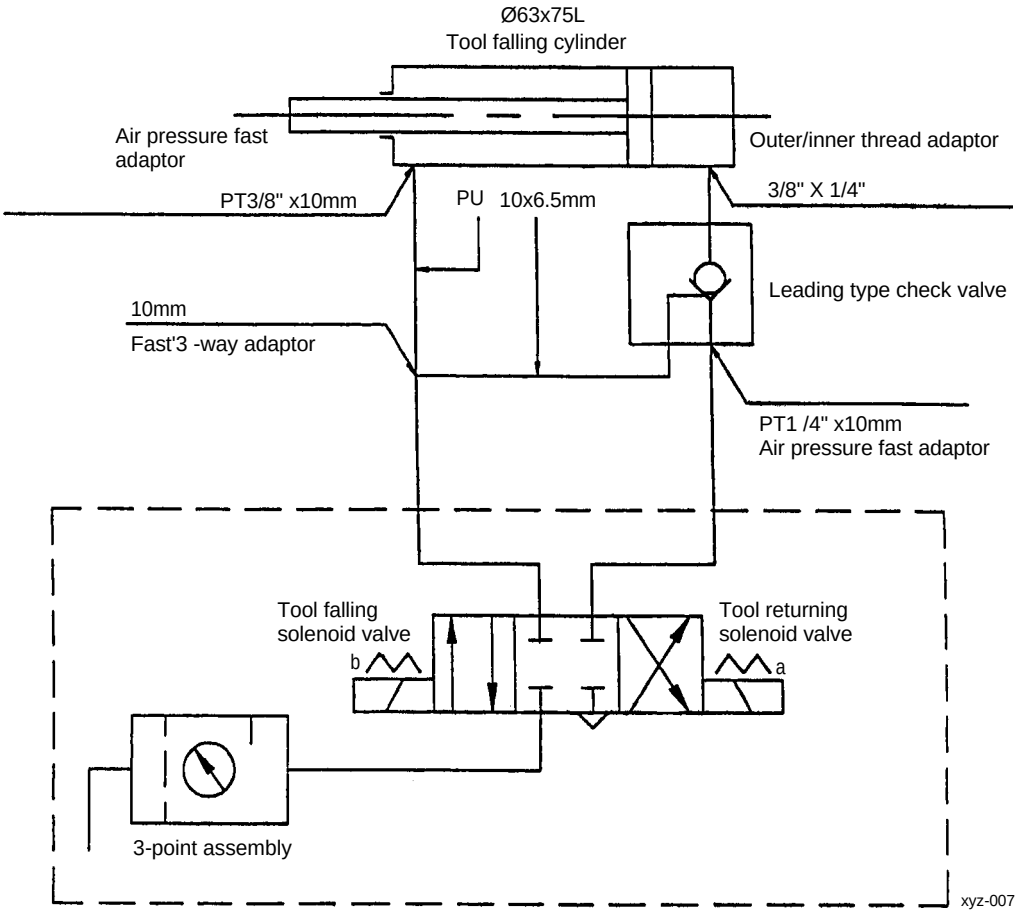


Figure 187 Air pressure wiring

13.0 Warranty

13.1 Warranty for the Machine

1. Subject to the conditions of the warranty, XYZ Machine Tools warrants that the Goods will, at their time of acceptance, remain free from defects in material and workmanship for the shorter of a period of 12 months or for 2000 hours of use.
2. The above warranty is given by XYZ Machine Tools subject to the following conditions:
   - XYZ Machine Tools shall be under no liability in respect of any defect arising from wilful damage, negligence, failure to follow the XYZ Machine Tools' instructions, misuse, alteration to the Goods (including by the removal of any guard or cover) or repair of the Goods in each case by the Purchaser, its employees or agents.
   - That it does not extend to parts, materials or equipment not manufactured by XYZ Machine Tools, in respect of which the Purchaser shall only be entitled to the benefit of any warranty or guarantee given by the relevant manufacturer.
   - XYZ Machine Tools shall be under no liability if full payment for any of the Goods has not been made by the Due Date.
3. Subject as expressly provided in these terms and conditions and except where the Goods are sold to a person dealing as a consumer (within the meaning of the Unfair Contract Terms Act 1977) all warranties and conditions or other terms implied by statue or common law are excluded to the fullest extent permitted by law. Where Goods are sold to a consumer the statutory rights of the consumer are not affected by these terms and conditions.
4. Without prejudice to item 2, any claim made by the Purchaser which is based on any defect in the quality or condition of the Goods shall be notified to XYZ Machine Tools in writing within 14 days from the date on which the defect or failure became apparent. Where such a claim is notified to XYZ Machine Tools, XYZ Machine Tools shall be given the opportunity of remedying the defect or failure and supplying (where necessary) replacement parts and completion of such remedial work shall constitute fulfilment of XYZ Machine Tools' obligations under the contract. Remedial work and replacement parts will be provided free of charge, provided the Purchaser at its own cost returns to XYZ Machine Tools the relevant Goods.
5. Without prejudice to item 4, XYZ Machine Tools at its sole discretion shall be entitled to refund the Purchaser the price of the Goods and shall have no further liability to the Purchaser under the contract.
6. Except in respect of death or personal injury caused by the negligence of XYZ Machine Tools, the total liability of XYZ Machine Tools to the Purchaser under this contract shall not exceed the price for the Goods.
7. Except in respect of death or personal injury caused by the negligence of XYZ Machine Tools, XYZ Machine Tools shall not be liable to the Purchaser by reason of any representation (unless fraudulent), warranty, condition or other term of the contract for any loss or damage (whether for loss of profit or goodwill), claims for consequential compensation which arise out of or in connection with the supply of the Goods.
8. XYZ Machine Tools shall not be liable to the Purchaser or be deemed to be in breach of the contract by reason of any delay in performing or any failure to perform XYZ Machine

Tools' obligations in relation to the Goods if the delay or failure was due to any cause beyond XYZ Machine Tools' reasonable control. Without prejudice to the generality of the foregoing, the following shall be regarded as causes beyond XYZ Machine Tools' reasonable control:

- Act of God, explosion, flood, tempest, fire or accident;
- War or threat of war, sabotage, insurrection, civil disturbance;
- Acts, restrictions, regulations, byelaws, prohibitions or measures of any kind on the part of any government, parliamentary or local authority;
- Import or export embargoes;
- Strikes, lock outs, or any other industrial actions or trade disputes (whether involving employees of the Company or a third party);
- Difficulty in obtaining the labour, fuel, parts or Goods from their manufacturer.